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Adaptation in the global stocktake: options to deliver on its mandate

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Abstract

This paper explores what the first global stocktake (GST1) under the Paris Agreement could usefully do in relation to two elements of its mandate on adaptation, namely, to review the adequacy and effectiveness of adaptation, and to enhance the implementation of adaptation action. This paper also discusses potential outputs from GST1, and how they could facilitate the intended outcomes of the process on adaptation, taking into account a learning-by-doing approach. This paper highlights that a comprehensive collective assessment of the adequacy and effectiveness of adaptation requires data that are currently not available for various reasons. Nonetheless, this paper finds that the GST's ability to incorporate learning and its scope for continuous improvement provides an important opportunity to develop, apply and refine approaches and methodologies over time to better address the GST's mandate on adaptation in subsequent cycles. The paper concludes that the GST1 process could help to inform and enhance Parties' adaptation efforts by identifying priority data needs and gaps, increasing understanding of different approaches to assessing adaptation actions, identifying enabling factors for effective adaptation, and building linkages with parallel processes including on the Global Goal on Adaptation. In this way, the GST1 could play an important role in helping to set a foundation for improved approaches and data on adaptation over time that can feed into future GSTs and support the long-term goals of the Paris Agreement.

JEL classifications : Q54, Q56, Q58, F53, O29

Keywords: Climate change, Paris Agreement, Global stocktake, Adaptation, UNFCCC, Monitoring and evaluation

Résumé

Le présent document étudie le rôle que pourrait jouer le premier bilan mondial de l'Accord de Paris en lien avec deux éléments de son mandat sur l'adaptation, à savoir : examiner l'adéquation et l'efficacité de l'adaptation, et renforcer la mise en œuvre de mesures d'adaptation. Il porte également sur les livrables potentiels du premier bilan mondial et la manière dont ils pourraient concourir aux résultats souhaités sur l'adaptation, en suivant une approche fondée sur l'apprentissage par la pratique. Il souligne le fait que pour procéder à une évaluation collective complète de l'adéquation et de l'efficacité de l'adaptation, il est nécessaire de disposer de données qui, pour diverses raisons, ne sont actuellement pas disponibles. Néanmoins, le document établit que la capacité du bilan mondial à intégrer les enseignements et la possibilité d'amélioration continue constituent une occasion majeure de développer, d'appliquer et d'affiner les approches et les méthodologies au fil du temps afin de mieux accomplir le mandat du bilan mondial sur l'adaptation lors des cycles ultérieurs. Le document conclut que le processus du premier bilan mondial pourrait contribuer à informer et à renforcer les efforts d'adaptation des Parties, en identifiant les besoins et les lacunes prioritaires en matière de données, en permettant de mieux comprendre les différentes approches en matière d'évaluation des mesures d'adaptation, en déterminant les facteurs favorables à une adaptation efficace, et en établissant des liens avec des processus parallèles, y compris avec l'objectif mondial en matière d'adaptation. Ainsi, le premier bilan mondial pourrait jouer un rôle essentiel en contribuant à définir les fondements de l'amélioration des approches et des données sur l'adaptation au fil du temps, qui pourront alimenter les futurs bilans mondiaux et soutenir les buts à long terme de l'Accord de Paris.

Classification JEL : Q54, Q56, F53, O29

Mots-clés : Changement climatique, Accord de Paris, Bilan mondial, Adaptation, Suivi et évaluation

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List of Acronyms

AC	Adaptation Committee
BTRs	Biennial Transparency Reports
BURs	Biennial Update Reports
CBD	Convention on Biological Diversity
CCXG	Climate Change Expert Group
CMA1	First Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
EU	European Union
GGA	Global Goal on Adaptation
GHG	Greenhouse Gas
GIZ	German Agency for International Co-operation
GlaSS	Glasgow-Sharm el-Sheikh work programme
GST	Global stocktake
GST1	First global stocktake
IDDRI	Institute for Sustainable Development and International Relations
IPCC	Intergovernmental Panel on Climate Change
LAKI	Lima Action Knowledge Initiative
LEG	Least Developed Countries Expert Group
M&E	Monitoring and evaluation
MEL	Monitoring, evaluation, and learning
MRV	Measurement, Reporting and Verification
NAPs	National Adaptation Plans
NC	National Communications

NDC	Nationally Determined Contribution
NGO	Non-governmental organisations
OECD	Organisation for Economic Co-operation and Development
PCCB	Paris Committee on Capacity-building
PPCR	Pilot Program for Climate Resilience
PROVIA	Global Programme of Research on Climate Change Vulnerability, Impacts and Adaptation
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SCF	Standing Committee on Finance
SDG	Sustainable Development Goals
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WGII	IPCC Working Group II

Executive summary

The global stocktake (GST) under the Paris Agreement is a periodic process to assess collective progress towards the long-term goals of the Agreement. The aim of this stocktaking exercise is to inform and enhance national actions and international co-operation for climate action. The GST also has a specific mandate on adaptation which includes enhancing implementation of adaptation action and reviewing the adequacy and effectiveness of adaptation. Several open questions remain on how to approach the different elements of the GST mandate on adaptation. Improving understanding of existing gaps, trade-offs, and potential approaches the GST could take in tackling its mandate on adaptation could help to guide the first GST (GST1), facilitate learning, and inform subsequent GSTs.

How a global level process like the GST could help to enhance implementation of adaptation action on the ground, as well as review the adequacy and effectiveness of adaptation at a collective level, are among the key outstanding questions relating to the GST mandate on adaptation. These questions pose significant conceptual, technical, and political challenges and currently have no straightforward answers.

This paper explores what the GST1 could usefully do in relation to two specific elements of its mandate on adaptation, i.e. to review the adequacy and effectiveness of adaptation and to facilitate enhanced implementation of adaptation action. This paper also highlights potential outputs from GST1, and how they could facilitate intended outcomes of the process on adaptation, taking into account the learning-by-doing approach of the GST. This paper focuses on two discrete elements of the GST's mandate on adaptation to avoid overcomplicating the analysis, while recognising the close inter-linkages between the different elements.

Challenges and key considerations for reviewing adequacy and effectiveness of adaptation action at the global level

Assessing the adequacy and effectiveness of adaptation action is an inherently complex task. Challenges to undertaking such assessments include the context-specific nature and long-time horizons of adaptation actions, as well as scientific uncertainty of the extent of adaptation needs over time. There are also challenges relating to limited data availability and shortcomings in current adaptation monitoring and evaluation (M&E) systems, including the lack of widespread coverage and focus of current systems on adaptation outputs (i.e. what has been done) rather than outcomes (i.e. what has changed because of the adaptation action). Assessing the adequacy and effectiveness of adaptation action is also closely linked to other elements of the GST mandate on adaptation, in particular support provided for adaptation and assessing progress towards the global goal on adaptation (GGA).

Nevertheless, assessing the adequacy and effectiveness of adaptation action is an important task at both the national level and international level. At the national level it can guide planning and implementation of adaptation action, inform priorities for adaptation support and lead to enhanced ambition. There is however currently limited information on the adequacy and effectiveness of adaptation action at the national level

for various reasons including methodological challenges, capacity constraints in some countries and the non-mandatory nature of countries' reporting requirements under the UNFCCC on these issues.

At the international level, assessments of adequacy and effectiveness of adaptation can help to assess collective efforts, contribute to the review of collective progress towards the GGA and identify gaps towards global goals. However, global assessments of adaptation progress carried out to date mainly focus on processes and outputs (i.e. policies and plans), with limited information on outcomes (i.e. whether climate risk and vulnerability have been reduced) given current data availability. However, increasing efforts by many Parties to develop and improve national adaptation monitoring and evaluation (M&E) systems, and subsequent reporting of such information including at the international level, will lead to a more comprehensive picture of adaptation globally and could contribute to assessments of collective progress, including under the GST.

Potential approaches to review adequacy and effectiveness of adaptation action

Different approaches can be used to review the adequacy and effectiveness of adaptation actions. This paper highlights that to inform an assessment of adequacy and effectiveness of adaptation action such as under the GST, it may be more appropriate to focus on outcomes (i.e. effects) rather than processes (i.e. planning and policies). Outcome-based approaches to assess adequacy and effectiveness of adaptation rely on a range of data sources, including country-led M&E systems.

A combination of different approaches in triangulated assessments or mixed methods, which bring together different types of information and methodological approaches, could provide a more comprehensive picture of the adequacy and effectiveness of adaptation action. For example, quantitative indicators could usefully be complemented with qualitative information and approaches, such as a theory of change, to help establish a cause-and-effect relationship between an adaptation action and its results and provide a more complete assessment.

Other global processes, including the Sustainable Development Goals (SDGs), Sendai Framework for Disaster Risk Reduction, and Convention on Biological Diversity (CBD), include different goals, targets, and indicators which relate to climate adaptation to varying degrees. These processes have developed systems through which national-level findings are reported back to the global level to inform collective assessments. These experiences provide insights on undertaking such a global assessment and highlight related challenges, e.g. the time and resources needed to gather a comparable set of data, and approaches to aggregate national information to provide a collective picture of progress. Further work on whether and how adaptation-related indicators in other global processes could feed into the GST could be helpful, e.g. to reduce the reporting burden, while recognising the differing focus of each global process.

There is no "common denominator" that can be used to aggregate the effects of actions in different countries. A collective assessment of adaptation under the GST will need to draw on various sources of information at different scales, apply different methodologies and complementary approaches. One possible approach could be to rely on country self-assessments of their own adaptation efforts which could in turn feed into a collective assessment under the GST, for example:

- Countries could undertake self-assessments of the adequacy and effectiveness of their own adaptation actions via different methods, e.g. triangulated assessments, mixed methods, scorecards, assessing outcomes on a continuum, etc. Country self-assessments could be focused on outcomes, in terms of capacity and risk for example, integrated in Parties' M&E processes, and build on lessons from current experiences and good practices.
- The GST could then compile findings from country self-assessments to provide an approximate assessment of global trends. This would necessarily be an approximate assessment, as it would involve an aggregation of non-comparable information. Nonetheless, it could enable the GST to

make a simple "traffic light" assessment of progress and gaps in relation to specific types of adaptation action (e.g. coastal protection), areas of the Global Goal on Adaptation (GGA) (e.g. increased adaptive capacity) or in relation to different global and regional climate risks.

Understanding how the GST can facilitate enhanced implementation of adaptation action

Another aspect of the GST mandate on adaptation is to "enhance the implementation of adaptation action" (Article 7.14 of the Paris Agreement). This is closely related to other elements of the GST mandate. For example, assessing the adequacy and effectiveness of adaptation action can provide an opportunity to learn from successful and unsuccessful practices to inform future adaptation efforts, adaptation support and implementation priorities. Similarly, reviewing the adequacy of adaptation support could potentially lead to enhanced implementation of adaptation action if it leads to increased and more effective delivery of adaptation support.

Beyond the agreed outcomes of the GST established in the Paris Agreement, there are further potential outcomes that could result from the process. For example, the GST1 could be helpful in:

- Identifying information needs and knowledge gaps to review adequacy and effectiveness on a consistent and comparable basis, which could in turn guide subsequent research efforts.
- Increasing understanding of available tools and methodologies for assessing adequacy and effectiveness of adaptation action, which could in turn inform the development and enhancement of Parties' M&E or monitoring, evaluation, and learning (MEL) systems to incorporate learning.
- Sharing good practices and lessons learned on effective adaptation actions, which could in turn help to inform and enhance Parties' adaptation actions.

How to reach the intended outcomes of the GST is critical but not easy. As highlighted in previous Climate Change Expert Group (CCXG) analysis, the focus, clarity, and format of the final package of GST outputs, and the participation of relevant stakeholders in their development, is key. The final package of GST1 outputs could set out recommendations targeting specific actors to encourage follow-up around the issue of adequacy and effectiveness of adaptation action. For example:

- Outputs from the technical assessment component of GST1 could include technical annexes identifying priority information needs and gaps for assessing the adequacy and effectiveness of adaptation; as well as setting out enabling factors and criteria for effective adaptation actions building on good practices.
- The consideration of outputs component of GST1 could include possible follow-up actions by Parties, UNFCCC processes and relevant bodies as set out below:
    - Parties could be invited to conduct self-assessments of their own adaptation efforts as part of their reporting on adaptation-related information in national submissions to the UNFCCC.
    - The Adaptation Committee, the Least Developed Countries Expert Group and the Standing Committee on Finance could be invited to take forward further technical work to assess different tools and methodologies for reviewing adequacy and effectiveness, and potential options to combine different approaches in triangulated assessments or mixed methods.
    - The Paris Committee on Capacity-building could be directed to prioritise capacity building support for GST follow-up including support for the development and enhancement of Parties' adaptation M&E/MEL systems.
    - The UNFCCC Secretariat could be to invited to consider how activities under the Glasgow-Sharm el-Sheikh work programme on the GGA could complement the GST process, including efforts to identify methodologies, indicators, data, and metrics for assessing progress towards

the GGA which could inform the review of adequacy and effectiveness in subsequent GST processes.

- The consideration of outputs component of GST1 could also include possible follow-up actions by non-Party stakeholders as set out below:
  - The research community, including the IPCC, could be invited to address priority gaps in information, guidance, and methodologies identified by the GST technical dialogue process, including updating relevant adaptation-related methodologies and technical guidelines.
  - Non-Party stakeholders could be encouraged to incorporate GST adaptation recommendations in their work such as supporting NAP planning processes as well as the development and enhancement of adaptation M&E / MEL systems in countries.

The GST provides an important milestone to take stock of collective efforts towards the long-term goals of the Paris Agreement and an opportunity to "course correct" and align efforts by Parties in line with the global goals. The ability to "course correct" is particularly important for adaptation, given the scale of the challenges faced. However, addressing the mandate of the GST on adaptation is not straightforward and there are several remaining gaps, including in currently available data.

Nonetheless, the GST has the benefit of being a periodic exercise to be repeated every five years with a provision for learn-by-doing. This scope for continuous improvement provides an important opportunity for the GST to develop, apply and refine approaches and methodologies over time as data availability improves. By identifying priority data needs and information gaps, increasing understanding of different approaches to assessing adaptation actions, identifying enabling factors for effective adaptation, and building linkages with parallel processes, including on the GGA, GST1 outputs could help to inform and enhance Parties' adaptation efforts. In this way, GST1 could play an important role in helping to set a foundation for improved approaches and data on adaptation over time that can feed into subsequent GST cycles and support the aims of the Paris Agreement.

1. Introduction

The global stocktake (GST) is a periodic process, established under Article 14 of the Paris Agreement, to assess collective progress towards the long-term goals of the Agreement. This includes the goal on adaptation set out in Article 2.1(b)[1] and the global goal on adaptation (GGA) established in Article 7.1. In addition, the Paris Agreement, in Article 7.14, provides a specific mandate to the GST in relation to adaptation, which includes enhancing the implementation of adaptation action and reviewing the adequacy and effectiveness of adaptation. The aim of this stocktaking exercise is to inform Parties in updating and enhancing national actions as well as enhancing international co-operation for climate action.

There remain several open questions on how to approach the different elements of the GST mandate on adaptation, including how a global level process like the GST could help to enhance implementation of action on the ground and how to collect information on and assess the adequacy and effectiveness of adaptation at a collective level. These questions have been discussed for several years and have no straightforward answers. Technical work on reviewing the adequacy and effectiveness of adaptation and support by the Adaptation Committee (AC), in collaboration with the Least Developed Countries Expert Group (LEG) and the Standing Committee on Finance (SCF), has been underway ever since an initial request in the Paris decision (UNFCCC, 2016[1]).

This paper aims to explore some of the open questions relating to two specific elements of the GST mandate on adaptation, namely, how to review the adequacy and effectiveness of adaptation in the GST process, and how the GST could facilitate enhanced implementation of adaptation actions. It approaches these two questions from the perspective of what the GST1 could usefully do in relation to these two specific elements of its mandate on adaptation, despite the numerous challenges faced. This paper does not focus on elements of the GST mandate relating to the review of adequacy and effectiveness of support nor the review of overall progress made in achieving the GGA. While these are important and closely related aspects of the GST mandate on adaptation, this paper keeps the elements of the GST mandate on adaptation separate to avoid overcomplicating the analysis, while recognising the close inter-linkages between them.

This paper is structured as follows: section 2. provides a brief background of adaptation in the GST process and some key challenges and considerations to addressing selected aspects of the GST mandate on adaptation. Section 3. explores possible approaches for reviewing the adequacy and effectiveness of adaptation action at the global level, building on current experiences. This includes Parties' efforts to monitor and evaluate adaptation actions, third-party assessments, and lessons from other international processes. Section 4. sets out how the GST process could help to enhance implementation of adaptation action. Finally, section 5. provides a synthesis of key findings and conclusions.

[1] All references to Articles are from the Paris Agreement unless indicated otherwise.

2. Overview and challenges to addressing selected elements of the GST mandate on adaptation

2.1. Unpacking the provisions of the GST mandate on adaptation

The GST provides a process to "assess the collective progress towards achieving the purpose of [the] Agreement and its long-term goals", as set out in Article 14.1 of the Paris Agreement. These goals include "increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development" (Article 2.1(b))[2] and the GGA of "enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change" (Article 7.1). The first global stocktake (GST1) is expected to conclude at the COP28 in November 2023 with the process to be repeated every five years. The aim is to "inform Parties in updating and enhancing, in a nationally determined manner, their actions and support in accordance with the relevant provisions of this Agreement, as well as in enhancing international co-operation for climate action" (Article 14.3) (UNFCCC, 2016[1]).

The overall mandate of the GST is set out in the Paris Agreement with more detailed provisions and modalities outlined in decision 19/CMA.1 and subsequent documents, including at COP26 and in guiding questions and informal notes issued by the Chairs of the Subsidiary Body for Implementation (SBI) and Subsidiary Body for Scientific and Technological Advice (SBSTA) (UNFCCC, 2018[2]; SBI and SBSTA Chairs, 2022[3]; UNFCCC and SBSTA, 2022[4]). The GST process is to be organised to a flexible manner that allows for learning-by-doing (UNFCCC, 2018[2]). It is meant to be a comprehensive exercise, covering mitigation, adaptation, means of implementation and support, while considering equity and the best available science in a cross-cutting manner. The GST may also take into account the consequences and impacts of response measures, and efforts to avert, minimise and address losses and damages as appropriate (UNFCCC, 2018[2]). Key concepts in the GST and selected provisions of its mandate on adaptation, as defined in this paper, are set out in Box 2.1.

Beyond the overall mandate for the GST established in the Paris Agreement, Article 7.14 of the Agreement also sets out a specific mandate for the GST in relation to adaptation to *inter alia*:

- "Recognise adaptation efforts of developing country Parties;
- Enhance the implementation of adaptation action taking into account the adaptation communication […]
- Review the adequacy and effectiveness of adaptation and support provided for adaptation; and
- Review the overall progress made in achieving the global goal on adaptation […]." (UNFCCC, 2016[1]).

[2] All references to Articles are from the Paris Agreement unless indicated otherwise.

Box 2.1. Defining concepts relating to the GST and adaptation in this paper

Components: Decision 19/CMA.1 outlined three components for structuring the GST process, i.e. 'Information collection and preparation', 'Technical assessment', and 'Consideration of outputs' (UNFCCC, 2018[2]).

Inputs: Refers to various sources and types of information used to inform the GST process (Jeudy-Hugo and Charles, 2022[5]). Initial sources of input for the GST are identified in the Paris Agreement and include adaptation communications (Article 14c) and information provided under the Enhanced Transparency Framework (Article 13.5 and Article 13.6) (UNFCCC, 2016[1]). Further non-exhaustive lists of sources and types of input are identified in decision 19/CMA.1, including reports and communications from Parties, reports of the Intergovernmental Panel on Climate Change (IPCC), synthesis reports prepared by the UNFCCC secretariat and reports from relevant constituted bodies (UNFCCC, 2018[2]).

Outputs: Refers to different elements produced by the GST process (Jeudy-Hugo and Charles, 2022[5]). This includes technical outputs (i.e. synthesis report of the 'Technical assessment' component) and political outputs (i.e. COP decision) (UNFCCC, 2018[2]).

Outcomes: Refers to the overall effects and changes in behaviour resulting from the work undertaken through the GST process. Outcomes can include intangible ("soft") effects, e.g., raising awareness, and tangible ("hard") effects, e.g., Parties' efforts to strengthen national actions informed by the GST (Jeudy-Hugo and Charles, 2022[5]).

Adequacy of adaptation action: "Adequacy refers to a set of solutions that together are sufficient to avoid dangerous, intolerable, or severe climate risks" (IPCC, 2022[6]) Thus, adequacy of adaptation refers to the extent to which adaptation actions are together sufficient to reduce the risks and impacts of climate change.

Effectiveness of adaptation action: "Effectiveness refers to the extent to which an action reduces vulnerability and climate-related risk, increases resilience, and avoids maladaptation" (IPCC, 2022[6]). Thus, an effective adaptation action is one that is successful in meeting identified adaptation needs or objectives over time, e.g., strengthening resilience, enhancing adaptive capacity, and reducing vulnerability as set out in the GGA, and does not lead to unintended consequences. Effectiveness of adaptation depends on context-specific factors and decreases with increasing warming (e.g., above 1.5°C global warming level, the effectiveness of certain adaptation measures will decrease).

Monitoring and evaluation (M&E) of adaptation: Monitoring refers to the collection of data and information to measure progress of adaptation actions towards intended objectives or goals while evaluation refers to the assessment of an on-going or completed project, programme or policy for different purposes (Noltze et al., 2021[7]; Price-Kelly et al., 2015[8]). M&E of adaptation refers to the act of tracking progress on adaptation actions to assess whether they have been impactful (Christiansen et al., 2016[9]; Price-Kelly et al., 2015[8]).

Monitoring, evaluation, and learning (MEL) of adaptation: MEL refers to the process of deriving lessons learned from the results of the M&E to inform and improve future adaptation actions (Noltze et al., 2021[7]). The provision for learning and continuous improvement is thus a central and integrated part of the design of the M&E system. Some countries are starting to integrate learning in the overall design of their M&E system; however this is not yet a widespread practice.

Note: Definitions of adequacy and effectiveness depend on various factors including the scope and purpose of the review, perceptions of different stakeholders. These factors may also change over time (Adaptation Committee, 2021[10])
Source: Authors based on listed sources.

The different elements of the GST mandate on adaptation are closely inter-related. For example, the provision of adequate and effective adaptation support can be seen as an enabler for effective adaptation action. Similarly, the provision of adequate and effective adaptation support can help enhance implementation of adaptation action. It is not possible to review overall progress made towards the GGA without assessing the effectiveness and adequacy of adaptation action and support. At the same time, improving understanding of the GGA could provide a clearer benchmark against which to assess adequacy and effectiveness of national adaptation actions. There are also links between adequacy and effectiveness. For example, adaptation measures cannot lead to intended outcomes if they are not sufficient (Adaptation Committee, 2021[10]) and in some cases, an adaptation action may be effective (i.e. result in reduced climate risk), but these reductions may not be sufficient (i.e. adequate) to eliminate the level of risk and avoid losses and damages (IPCC, 2022[6]). Such inter-linkages are important to recognise, however they risk over-complicating the task at hand and could be further explored and unpacked over time as approaches are developed, data availability improves, and experiences gained.

Technical work on different elements of the GST mandate on adaptation has been carried out by relevant bodies under the UNFCCC since 2016. In decision 1/CP.21, paragraph 45(b)), the AC and the LEG, in collaboration with the SCF, were tasked with taking forward technical work to develop methodologies and make recommendations on reviewing adequacy and effectiveness of adaptation and support for consideration at the first Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA1) (UNFCCC, 2016[1]). At CMA1, Parties noted the current state of knowledge was not sufficient to address the mandate and invited the AC, LEG, and SCF, to continue compiling methodologies (decision 11/CMA.1, paragraphs 32–36) (Adaptation Committee - Least Developed Countries Expert Group, 2022[11]). Work by the AC, LEG, and SCF found that conducting reviews at the collective level continues to pose significant conceptual, technical and political challenges and currently no clear direction of how to undertake such assessments (Adaptation Committee, 2022[12]). A joint AC-LEG-SCF working group has been established to further contribute to this technical work, e.g. by developing potential review criteria and indicators for reviewing adequacy and effectiveness (Adaptation Committee - Least Developed Countries Expert Group, 2022[11]).

2.2. Insights on adequacy and effectiveness from adaptation-related national submissions to the UNFCCC

Initial sources of input to be considered in the GST process are identified in the Paris Agreement, and include information provided by Parties in their adaptation communications (Article 14c), National Adaptation Plans (NAPs) as well as under the Enhanced Transparency Framework (ETF) (Article 13.5 and Article 13.6). Further non-exhaustive lists of sources and types of inputs are identified in decision 19/CMA.1 (UNFCCC, 2018[2]) and also agreed at COP26 (UNFCCC and SBSTA, 2022[4]).

As Parties are not required to report on adaptation effectiveness and not all adaptation-related information is submitted to the UNFCCC, it is difficult to rely only on NDCs, NAPs, adaptation communications and other documents to develop a robust assessment of adequacy and effectiveness to inform the GST (Kato and Ellis, 2016[13]). While countries “should” periodically submit and update an adaptation communication (AC) as a component of or in conjunction with other communications, including a national adaptation plan (NAP), NDC and/or a national communication (NC) (UNFCCC, 2016[1]), there is no requirement to do so. Furthermore, under Article 13.8 of the Paris Agreement, Parties “should” provide information on impacts and adaptation in their regular reports under the ETF (UNFCCC, 2016[1]). Adaptation-related information in Parties’ submissions to the UNFCCC differ in their nature, scope, and focus as set out below:

- Many countries include adaptation information in their NDCs although this is not a requirement. Adaptation-related information in NDCs often outline the national context, areas vulnerable to climate change, priority areas and future adaptation goals (UNFCCC, 2021[14]).

- National communications (NCs) "shall" include information on expected climate change impacts and outline action taken relating to adaptation (UNFCCC, 2020[15]) (UNFCCC, 1992[16]). Parties are "encouraged", but not required, to use a reporting structure which includes information on M&E as well as on "progress and outcomes of adaptation action" (UNFCCC, 2020, p. 46[15]). A review of NCs from selected developing[3] and developed[4] countries, indicates few examined countries discuss effects of adaptation actions and whether actions are adequate or effective.
- Current reporting guidelines for Biennial Update Reports (BURs) do not require non-Annex I Parties to provide information on adaptation actions, except in relation to the provision of support to developing countries (UNFCCC, 2012[17]). Under new guidelines for Biennial Transparency Reports (BTRs) (UNFCCC, 2012[17]), developing countries are requested to include information on the status of the supported activity, its impacts and expected results when reporting information on financial support received. Reporting such information remains non-mandatory under the ETF and is likely to be limited given various challenges (OECD, 2022[18]).
- The voluntary NAP process aims "to reduce vulnerability to the impacts of climate change and to facilitate the integration of climate change in development planning" (UNFCCC LDC Expert Group, 2012, p. 11[19]). NAPs can both help set out how adaptation targets from NDCs could be implemented and can also provide information for NDC updates (NAP Global Network, 2019[20]).
- Adaptation communications are voluntary and aim to increase visibility of adaptation; strengthen adaptation action and support for developing countries; provide input to the GST; and enhance learning and understanding of adaptation needs and actions (9/CMA.1) (UNFCCC, 2019[21]). As of October 2022, 48 adaptation communications have been submitted to the UNFCCC, of which 71% are from developing countries, and 29% from developed countries (UNFCCC, 2022[22]).

The different country submissions on adaptation also have different cycles, i.e., every four years for NCs, every five years for NDCs, every two years for BTRs. There is thus no common periodicity nor one common source of information for reporting on adaptation which can make it difficult to access the most recent adaptation information for all countries at any one time. Information on adaptation can also be found in various national documents not submitted to UNFCCC (UNFCCC, 2022[23]; UNFCCC, 2021[14]). Information in national documents is more scattered and may be more difficult to incorporate as a source of input in the GST (e.g. if the documents are only available in the national language and/or if documents are not submitted via the GST submission portal).

More Parties are providing adaptation-related information in their NDCs, as of 31 December 2021[5], compared to 2015 NDC submissions (UNFCCC, 2022[24]). This includes information on more comprehensive, targeted adaptation efforts, quantitative time-bound targets and indicators on adaptation, and further details on indicator frameworks for monitoring progress (UNFCCC, 2022[25]; UNFCCC, 2022[24]). Of the 166 NDCs submitted by Parties in 2021, 14% highlighted their intention to apply quantitative indicators to monitor climate impacts and progress (UNFCCC, 2021[14]). In contrast to qualitative, open-ended adaptation targets in previous NDCs, 26% of Parties in their 2021 NDCs, outlined quantitative targets in priority sectors or areas – see Table 2.1 (UNFCCC, 2022[24]; UNFCCC, 2021[14]).

[3] Based on a sample of 11 NCs from developing countries (Armenia, Azerbaijan, Brazil, Chile, Costa Rica, Mexico, Mauritius, Ghana, Georgia, Korea, Singapore) submitted from 2018-202 (UNFCCC, 2022[134])

[4] Based on sample of 11 NCs from developed countries (Australia, Canada, Cyprus, Denmark, Japan, Malta, Netherlands, Norway, Portugal, Slovenia, Spain, US) submitted from 2017-2021 (UNFCCC, 2021[133]).

[5] The 166 NDCs consist of 131 new/updated submission and 35 NDCs that have not been updated (UNFCCC, 2022[24])

Table 2.1. Examples of quantified national targets identified in Parties' NDCs

Adaptation area	Quantified targets	Example
Food production and nutrition security	Increasing food security for the most vulnerable 10 per cent of the population	Papua New Guinea (Government of Papua New Guinea, 2020[26])
Freshwater resources	Reducing water vulnerability from 0.51 to 0.30 units according to a national vulnerability index by 2030	Bolivia (Plurinational State of Bolivia, n.d.[27])
Terrestrial and wetland ecosystems	Increasing the area of forest protected from diseases, pests, and fire to 17.2 million ha by 2030	Ethiopia (Federal Democratic Republic of Ethiopia, 2021[28])
Human health	Ensuring that all health companies and authorities have developed disaster risk management plans	Colombia (Government of Colombia, n.d.[29]) , Chile (Government of Chile, 2020[30])
Key economic sectors and services	Investing USD 1.2 billion in climate-resilient transport infrastructure	Papua New Guinea (Government of Papua New Guinea, 2020[26])
Disaster risk management	Introducing extreme weather event early warning systems for 70 per cent of the population	Papua New Guinea (Government of Papua New Guinea, 2020[26])
Urban areas and other human habitats	Relocating families living at 2,500 flood-prone or contaminated sites by 2020	Uruguay (Oriental Republic of Uruguay, 2017[31])
Livelihoods	Implementing adaptation measures targeting 50 per cent of vulnerable communities identified in the national vulnerability atlas	Mexico (Government of Mexico, 2020[32])
Coastal and low-lying areas	Ensuring that 20–70 per cent of coasts have protection measures in place	Saint Vincent and the Grenadines (20%) (St. Vincent and the Grenadines, 2015[33]) Singapore (70%) (Government of Singapore, n.d.[34])
Ocean ecosystems	Expanding mangrove forest area by 5 per cent in 2018–2030	Samoa (Ministry of Natural Resources and Environment [MNRE], n.d.[35])

Source: (UNFCCC, 2021[36]) and Personal communication.

Despite increased information on adaptation in national submissions to the UNFCCC, "Parties generally stopped short of illustrating the extent to which the actions implemented are adequate or effective under different climate change scenarios and time-horizons" (UNFCCC, 2022, p. 53[25]). In national reports[6] to the UNFCCC, many Parties use process-indicators to describe progress in planning and implementing adaptation action. For instance, Georgia and Morocco outline expected impacts but do not evaluate implemented measures (Ministry of Environmental Protection and Agriculture of Georgia, 2021[37]; Ministère de la Transition Energetique et du Developpement Durable, 2021[38]).

In national reports, some Parties refer in general terms to successes in adaptation efforts/preparedness to current or future risks from adaptation actions (UNFCCC, 2022[25]). A few Parties set out specific results achieved (e.g. reduced mortality from high temperatures, intensity and duration of heatwaves; reduced area affected by forest fires despite increase in fire risk indices) to indicate effectiveness of adaptation (UNFCCC, 2022[25]). Some Parties also outline challenges, barriers, and gaps to making progress on adaptation (e.g., institutional frameworks, capacities, data gaps), which partly reflect the adequacy and effectiveness of efforts (UNFCCC, 2022[25]). Some Parties highlight the inadequacy of adaptation actions in national documents, for example a national evaluation report on adaptation in the infrastructure and

[6] National reports include national communications (NCs), Biennial Reports, and Annex I GHG Inventories for Annex I countries, while it entails NCs, BURs and National Adaptation Programmes of Actions for Non-Annex I countries (UNFCCC, 2022[119])

building sector in Norway concluded that an overview of adaptation progress was missing, partly due to a lack of sufficient information (Riksrevisjonen, 2022[39]).

M&E of adaptation provides an important source of information on adequacy and effectiveness of actions. A robust M&E system that incorporates learning - Monitoring, Evaluation and Learning (MEL) - can help Parties to continuously improve their adaptation actions (Price-Kelly et al., 2015[8]) and contribute to other processes including the GST (UNEP, 2021[40]). Some countries are starting to integrate learning in the overall design of their M&E systems; however this is not yet a widespread practice.

Despite the important role of M&E, there is currently limited coverage of M&E systems across countries. Only 26% of Parties have M&E systems in place, 25% have published M&E progress reports while only 8% evaluate their adaptation plans (UNEP, 2021[40]). Out of 170 countries with adaptation strategies, only few have operational frameworks which track and evaluate implementation and results (Leiter, 2021[41]). Furthermore, more than 60% of 70 countries with NAPs do not assess implementation of their NAPs (Leiter, 2021[41]). There are however increasing efforts by Parties to enhance their adaptation M&E systems, for example:

- In Bangladesh the National Resilience Programme published a progress report assessing annual outputs, which will go towards an assessment and evaluation of outcome indicators (UNDP, UNW and UNOPS, 2022[42]).
- Canada is in the process of developing an initial set of indicators and targets for a reporting and evaluation framework to assess progress on adaptation (Government of Canada, 2022[43]).
- Japan plans to develop an M&E system comprising of indicators and tools to evaluate the reduction of climate impacts and aggregate information on initiatives by other countries and municipalities to ((Ministry of the Environment Government of Japan, 2021[44]).
- Peru is developing an Adaptation and Mitigation Measures Monitoring System with different tools and modules relating to adaptation including an M&E plan, guidelines for implementation and evaluation, (Rodríguez, 2022[45]; CTCN, 2021[46]).
- Rwanda plans to develop a Measurement, Reporting and Verification (MRV) system for adaptation actions, to, among others, assess effectiveness of adaptation and facilitate access to finance (NAP Global Network, n.d.[47]).
- In Sweden, an adaptation M&E system is being built to gather data and regularly evaluate adaptation progress, drawing on information from public agencies, regional and local administrations with responsibilities for adaptation, and integrating a learning-by-doing approach (Hjerpe and Sjöström, 2020[48]).

2.3. Potential issues and challenges to reviewing adequacy and effectiveness in the context of the GST

Assessing adequacy and effectiveness is important at the national level to guide planning, implementation, and enhanced ambition, and at the international level to assess collective efforts and identify gaps towards global goals. However, assessing effectiveness of adaptation is complicated by different factors including "the lack of a clear goal that signifies effective adaptation, varied conceptual framings and metrics used to assess effectiveness, and low empirical evidence on effectiveness of implemented adaptation actions" (IPCC, 2022[6]). Challenges to assessing adequacy and effectiveness of adaptation are set out in Box 2.2 and selected challenges discussed below[7].

[7] There are also various challenges to assessing the adequacy and effectiveness of support provided for adaptation relating to data limitations, temporal aspects, difficulties in attributing causality, differing understandings of what

Box 2.2. Overview of some methodological and practical challenges to assessing adequacy and effectiveness of adaptation

- **Aggregating** sub-national and national-specific metrics and information at the international level to capture collective progress.
- **Difficulties in attributing** observed or projected changes to a particular adaptation action and those changes resulting from other types of policies and trends, such as development co-operation interventions, given the dynamic context (i.e. changing climate risk and socio-economic systems) in which adaptation occurs.
- **Counterfactuals** - estimating risk reduction involves the use of counterfactuals to compare the outcome of an adaptation action with a hypothetical situation without adaptation and other changes (e.g., quantifying the damage a flood would have caused if a certain community did not adapt in advance of a storm). Different assumptions concerning counterfactuals can lead to different evaluations of adequacy and effectiveness.
- **Uncertainty of climate impacts and future hazards**, and the extent to which climate impacts will change over the lifetime of the adaptation action or after its completion, may affect both the design of effective adaptation actions and may also influence judgements of how to assess the adequacy and effectiveness of different adaptation actions.
- **Different goals for adaptation and diverse risk perceptions** across and within societies or groups may lead to different evaluations of effectiveness and adequacy of an action.
- **Failure to account for negative side effects** - an adaptation action may be effective in one location (e.g. upstream) but have negative impacts elsewhere (e.g. across national borders) and at different times (e.g. short- vs. long-term). Maladaptation refers to "[a]ctions that may lead to increased risk of adverse climate-related outcomes" and "is usually an unintended consequence" (IPCC, 2018, p. 553[49]).
- **The temporal aspect** is important as the benefits of some adaptation measures take a long time to emerge. This potentially long timeframe makes it intrinsically difficult to assess the effectiveness of adaptation actions as their benefit may only be realised in future years or decades. Moreover, accelerating climate impacts can also decrease the effectiveness of certain adaptation actions (i.e., the effectiveness of certain actions in terms of reducing vulnerabilities, exposure, and risks, may decrease as warming increases).
- **Adaptation limits** faced by human and natural systems can also influence the effectiveness of adaptation action. The concept of adaptation limits is linked to mitigation ambition as less action on mitigation may reduce the adequacy and/or effectiveness of certain adaptation actions or could make certain adaptation actions infeasible.
- **Lack of widespread application of M&E systems in countries** and more of a focus in existing M&E systems on adaptation processes (e.g. integration of adaptation in sectoral policies) rather than outcomes and impacts (e.g. reduction in vulnerability).
- **Lack of financial resources and human capacities** to implement robust M&E systems.
- **Limited data** availability, consistency, completeness, and accuracy of socio-economic and climate data at relevant scale and coverage across sectors and jurisdictions.

Source: Authors based on (Adaptation Committee, 2021[10]), (IPCC, 2022[6]) and (FAO, 2018[50]).

constitutes effective climate finance, aggregation issues etc. For further discussion, see for example: (Singh et al., 2021[138]) (OECD, 2022[18]) (Ellis, Caruso and Ockenden, 2013[137]) (Ye Zou and Ockenden, 2016[70])

One important challenge relates to the aggregation needed to undertake a collective assessment of adequacy and effectiveness. Aggregation also poses challenges at the project, sub-national and national level. For example, at the national level, some information may be lost when aggregating information from sub-national and local levels as details of context-specific information may not be captured in the process to synthesise information. At the international level, this problem is compounded as even more context-specific information is lost in the synthesis exercise and aggregated information may not be able to comprehensively reflect all the nuances in different countries' experiences (IISD and NAP Global Network, 2022[51]). Assessing adequacy and effectiveness at the collective level therefore requires going beyond simply aggregating national and sub-national information to consider context-specific nuances (e.g. with the use of qualitative information). Such nuances could include the interconnected nature of climate risks across borders, regions, and sectors; reflecting adaptation actions by non-party stakeholders; and potential negative externalities (IPCC, 2022[6]).

Another important and related challenge is the M&E of adaptation. Functioning adaptation M&E systems at sub-national and/or national level are required to track progress on adaptation, including on adequacy and effectiveness, identify learning opportunities and where additional action may be needed (Adaptation Committee, 2022[12]). M&E systems are critical to assess adequacy and effectiveness to inform both national and international processes. However, as discussed above, the rate of take-up of M&E systems remains slow, reflecting various methodological and empirical challenges that complicate adaptation M&E, as well as capacity and resource constraints (OECD, 2015[52]; Smith et al., 2019[53]; Adaptation Committee, 2022[12]) (Vallejo, 2017[54]). The lack of widespread application of M&E systems, limits the ability to track progress on adaptation. Moreover, most monitoring of adaptation actions to date focuses on planning and implementation, with limited focus on adaptation outcomes reflecting numerous challenges to measuring the outcomes and impacts of adaptation action.

Assessments of adequacy and effectiveness are usually part of broader evaluations of the adaptation process which encompass various criteria such as relevance, coherence, impact, efficiency, sustainability and overlaps with M&E more generally (Adaptation Committee, 2021[10]). Key considerations for the design of global adaptation assessment approaches are discussed in the IPCC Working Group II (WGII) Report (2022[6]) and summarised in Box 2.3. Other issues to consider when assessing adequacy and effectiveness of adaptation, include the potential for maladaptation. The potential for maladaptation indicates that adaptation actions do not necessarily translate into increased adaptive capacity, strengthened resilience or reduced vulnerability, and "thus complicates the path towards adequate and effective adaptation" (UNFCCC, 2022[25]).

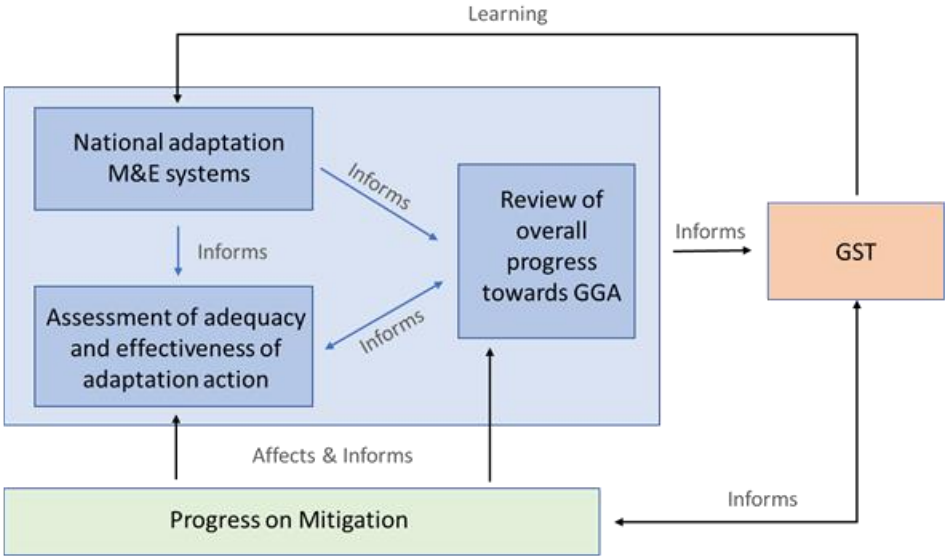
Box 2.3. Key considerations for designing global adaptation assessments

- **Comparability** – context-specificity of adaptation and varying underlying objectives limits meaningful comparisons of adaptation over time and across sectors/regions.
- **Aggregation** - options for aggregating data from the local, sub-national, national, and regional level to the global level range from qualitative synthesis of elements to a more quantitative aggregation (e.g., condensing different variables into one score). Adaptation does not have a global reference metric against which to assess progress and a simple mechanical aggregation (e.g. based on standardised indicators), may fail to capture nuances on the ground.
- **Assessing adaptation in terms of inputs, processes, output, and outcomes** – given inherent challenges in measuring adaptation outcomes, most national and global assessments focus on outputs (i.e. adoption of adaptation plans). However, understanding effectiveness of adaptation globally requires an approach that captures adaptation outcomes (e.g. in terms of climate risk reduction), while avoiding simplifications that may hide maladaptation).
- **Data availability** – limited availability of consistent data at the global level affects the approach taken, ability to meet objectives and may lead to biases (e.g., in framing or interpretation of outcomes). In some cases, instead of relying on data provided nationally, new global datasets could be developed or data from Earth Observation used. This, however, also has some trade-offs in terms of the breadth versus the depth of data, i.e., globally available yet generic data versus regional or local data which is more detailed but irregular and/or sparse.

Source: (Garschagen et al., 2022[55]).

There are also conceptual and substantive links between reviewing progress towards the GGA, reviewing adequacy and effectiveness, and M&E of adaptation – see Figure 2.1. The GGA, reviewing adequacy and effectiveness, and M&E of adaptation are closely inter-related. It is not possible to assess effectiveness and adequacy or progress towards the GGA without functional M&E systems (and ideally MEL systems to incorporate learning). It is not possible to assess progress on the GGA without assessing the effectiveness and adequacy of action. At the same time, improving understanding of the GGA, including through discussions under the GlaSS work programme (UNFCCC, 2021[56]); (UNFCCC, 2022[57]) could inform subsequent national-level adaptation goals and targets and provide a clearer benchmark against which to assess adequacy and effectiveness of action. There is also a close link with mitigation ambition and efforts to assess adaptation action as certain adaptation actions will not be effective in high temperature scenarios (IPCC, 2022[6]).

Figure 2.1. Mapping links between adaptation M&E, the GGA and the GST



Source: Authors.

3. Potential approaches for reviewing the adequacy and effectiveness of adaptation action

3.1. Potential tools and approaches for reviewing adequacy and effectiveness

There are different approaches, tools, and methods to reviewing adequacy and effectiveness at different scales. The suitability of different approaches depends on the underlying objectives of the assessment (e.g. to improve transparency, enhance accountability, better understand effectiveness, or guide the design and implementation of policies). In the context of the GST, the purpose of reviewing adequacy and effectiveness of adaptation is to contribute to the review of collective progress towards the goals of the Paris Agreement (Article 2.1b and Article 7), inform Parties in updating and enhancing their adaptation actions, and enhance international co-operation for adaptation action (Adaptation Committee, 2021[10]).

Approaches to reviewing adequacy and effectiveness can focus on different elements of the adaptation planning and implementation process. For example, assessments of effectiveness can focus on the adaptation process (i.e. planning and policies) and/or outcomes (i.e. immediate or overall effects of the action). Assessments of adequacy can consider measures of quality (i.e. defining long-term objectives and assessing the extent to which this has been reached) and quantity (i.e. assessing the scope/coverage of the action and whether this is sufficient in relation to identified objectives) (Craft and Fisher, 2016[58]). Approaches which focus on outcomes rather than processes may be more appropriate to inform a review of adequacy and effectiveness given that the concepts of adequacy and effectiveness relate mostly to the results or outcomes of an action (Adaptation Committee, 2021[10]).

An overview of selected outcome-based methods for reviewing adequacy and effectiveness, and associated pros and cons, is set out in Table 3.1. A combination of different approaches could provide a more robust approach at the global level (Berrang-Ford et al., 2019[59]). For example, specific indicators could be complemented with qualitative information and approaches, such as a theory of change to help establish a cause-and-effect relationship between an adaptation action and its results. The UK is for example developing visions of adaptation pathways in consultation with relevant non-Party stakeholders to embed the theory of change approach in adaptation planning processes (UK Government, 2022[60]).

Triangulated assessments or mixed methods which bring together different types of information (quantitative and qualitative) and methodological approaches, could help to provide a more comprehensive picture of the adequacy and effectiveness of adaptation action. There has been limited application of triangulated assessments to date and there remains scope to further explore the strengths and weaknesses of different approaches and their potential synergies in complementing each other (IPCC, 2022[6]).

Table 3.1. Potential approaches for assessing adequacy and effectiveness of adaptation actions

Approach	Description	Pros and cons
Climate risk/ vulnerability assessments	Monitoring climate risk and/or vulnerability over time as a measure of adaptation success and to track progress on adaptation. Could be accompanied by an analysis of how adaptation measures have contributed to the reduction of climate risk and/or vulnerability, considering challenges in linking specific adaptation actions to specific risk-reduction outcomes.	– Unclear how capacities increase, or lead to sustainable changes over time - Resilience is context-specific so not easy to understand what it looks like on a global level
Theory of change	Applying a theory of change to explain how adaptation is assumed to take place and comparing this to the actual situation can inform an assessment of effectiveness.	+ Can contribute to shared understanding of adaptation actions and intended benefits among stakeholders and can help assess outcomes of adaptation efforts if designed in participatory approach + Can help establish a cause-and-effect relationship between an adaptation action and its measured results
Consulting beneficiaries	Using local stakeholder consultation and other participatory processes to assess whether implemented actions have enabled beneficiaries to better deal with climate change impacts. Needs to be carefully designed to be objective, robust, and tailored to intended M&E purpose.	- Stakeholders may not be fully able to correctly assess if adaptation action had a direct effect on the outcome. - Stakeholders views may be biased based on experiences + Can make use of new technologies (e.g., mobile phones) to generate real-time, high-frequency monitoring results.
Assessment of development progress	Focus on ultimate outcomes of adaptation action, namely that development is continuing despite climate risks/impacts	+ Useful for understanding ultimate impact - Need long timeframes to see impacts - Challenge of attribution
Impact evaluations	Uses two groups, of which one (treatment group) is exposed to an adaptation action while the other group (control group) is not exposed and acts as a counterfactual.	+ Contributes to improved understanding of risk reduction impacts + Provides lessons on gaps/barriers - Difficulties in finding groups with similar characteristics - Cost of collecting data - Often needs to be combined with other methods to determine impact of a policy/programme.

Source: Based on (Adaptation Committee, 2021[10]); (Adaptation Committee, 2022[12]); (Craft and Fisher, 2016[58]) and (FAO, 2018[50]).

Most available global assessments of adaptation focus on processes and outputs (e.g., policies and plans) with limited information provided to date on outcomes (i.e., reduction of climate risk and vulnerability) (Berrang-Ford et al., 2021[61]). For example, the UNEP Adaptation Gap report assesses adequacy and effectiveness of adaptation indirectly by looking at planning and implementation efforts and examining criteria such as comprehensiveness, inclusiveness, ease of implementation, integration, and M&E. The report concludes that despite progress, significant gaps remain and the "ultimate test" of adequacy and effectiveness of adaptation planning "will be whether these plans are implemented and, in turn, whether this implementation reduces risks and vulnerability and bolsters resilience and adaptive capacity" (UNEP, 2021[40]). Limited data availability has affected the coverage of outcome-related aspects of adaptation in global assessments to date; however, this is gradually improving with data availability. For example, the

2022 UNEP Adaptation Gap report will have a chapter focused on effectiveness (Personal communication, 2022).

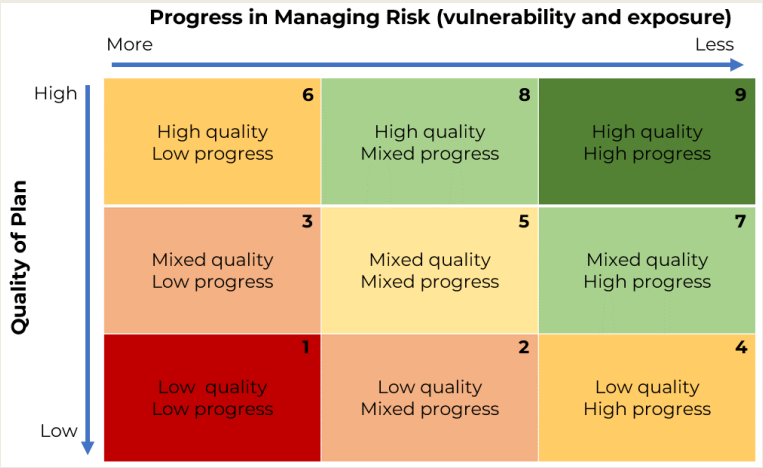
While processes (i.e. planning and policies) are more straightforward to track, they provide limited information to inform a review of adequacy and effectiveness which relate to the results or outcomes of an action. There are a number of challenges to measuring outcomes and impacts of adaptation action including interlinkages between adaptation and development interventions, the potential time lag between an adaptation action and its results (e.g. how to assess the effectiveness of flood defences built to withstand a 1 in a 100 year flooding event when you may not know for a long time whether it has worked as planned) and the imperfect flow and sharing of information between different actors (e.g. actors at national level responsible for preparing reports to the UNFCCC, and at sub-national level responsible for carrying out many adaptation actions) (Adaptation Committee, 2022[12]). Outcomes of adaptation actions may thus need to be assessed via the use of proxies. For example, the UK's adaptation assessment framework uses proxy indicators as measures of effectiveness, e.g. habitat conditions and species abundance are used as a proxy indicator for biodiversity. In Germany certain trend descriptions of impact and response indicators could be used as a proxy for the effectiveness of adaptation actions - see Box 3.1.

Box 3.1. Approaches to assessing effectiveness of adaptation: Insights from the UK and Germany

In the **UK,** regular assessments of adaptation actions have been conducted by the Climate Change Committee (CCC) since 2015 based on a cross-sector indicator framework and analysis that combines qualitative and quantitative information as well as evidence from multiple sources. A colour-coded framework is used to assess 34 adaptation priorities based on whether progress is being made in managing risk and the quality of the adaptation plan (see Figure 3.1). A high score in managing risk indicates climate risk is reduced at an adequate rate and/or that the adaptation action is on track to meet its goals. A high score in the quality of the adaptation plan indicates it considers high climate change scenarios, outlines specific actions, fulfils SMART criteria[8] and has an effective M&E system (Climate Change Committee, 2021[62]).

The UK's adaptation assessment framework currently only includes indicators that measure inputs and outputs, rather than outcomes or impacts (OECD Forthcoming, 2023[63]). Proxy indicators are in some instances used as measures of effectiveness, e.g. for assessing biodiversity proxy indicators include habitat conditions and species abundance. Proxy indicators are influenced by several factors, e.g. climate change, water flow, and vegetation cover, and do not necessarily reflect the direct impact of adaptation actions (OECD Forthcoming, 2023[63]). This gap in metrics to measure outcomes led the CCC to call for the next NAP iteration, to set measurable outcomes and a detailed M&E framework to track the effectiveness of adaptation (Climate Change Committee, 2021[62]).

Figure 3.1. UK framework to assess progress on national adaptation priorities



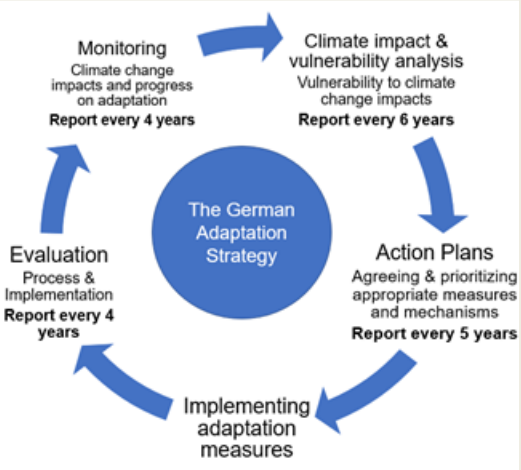
Source: Authors based on (Climate Change Committee, 2019[64]).

In **Germany**, the adaptation M&E system is comprised of multiple components which feed into and inform each other in a circular reporting and evaluation system – see Figure 3.2. An evaluation of the adaptation strategy is conducted every four years by independent evaluators. The process aims to review the implementation of measures to assess whether they contributed to improving the adaptive capacity of ecological, social and economic systems and reduced their vulnerability, while also seeking to facilitate a learning process (Kind, Kaiser and Gaus, 2019[65]).

One component of this system is the production of an indicator-based monitoring report. The 2019 monitoring report incorporates 15 action areas [9] with associated climate change impact and response indicators. Each indicator has a trend description (i.e. rising trend, falling trend, trend reversal, and no trend) and a trend appraisal (i.e. favourable development (green), unfavourable development (red) or

appraisal is impossible (black)). Current indicators focus on inputs and outputs (e.g., heat warning service and success of heat warning service), rather than outcomes, although some elements, such as the trend reversal label could be used as a proxy to assess the effectiveness of adaptation actions. The combination of different components in the German M&E system, including monitoring reports and independent evaluation reports, provide useful insights which could feed into/inform assessments of collective progress (German Environment Agency, 2019[66]).

Figure 3.2. The German adaptation strategy reporting cycle



Source: Authors based on (Die Bundesregierung, 2020[67]).

There are also international guidelines and other approaches which could support a review of the effectiveness of adaptation action. This includes technical guidelines for the NAP process elaborated by the LEG which includes a section on identifying the effectiveness of the NAP process (LDC Expert Group, 2012[68])–see Box 3.2. Given the context-specificity of adaptation, any metrics, indicators, frameworks, and guidelines need to be flexible enough to fit different contexts (Owen, 2020[69]). Experiences in other areas, such as international development co-operation could also provide lessons for assessing adaptation actions. For example, years of experience in international development co-operation provides insights on the delivery of effective aid. These lessons are summarised in aid effectiveness principles which are considered best practice in the development co-operation community and could provide some insights when considering effective international climate finance, including support for adaptation (Ye Zou and Ockenden, 2016[70]).

[8] Specific, Measurable, Achievable, Relevant, and Time-Bound

[9] Human health; Water regime, water management, marine and coastal protection; Fisheries; Soil; Agriculture; Woodland and forestry; Biodiversity; Building industry; Energy industry; Transport, transport infrastructure; Trade and industry; Tourism industry; Financial services industry; Spatial planning, regional and urban development; Civil protection

Box 3.2. Selected guidelines and approaches for reviewing adaptation actions

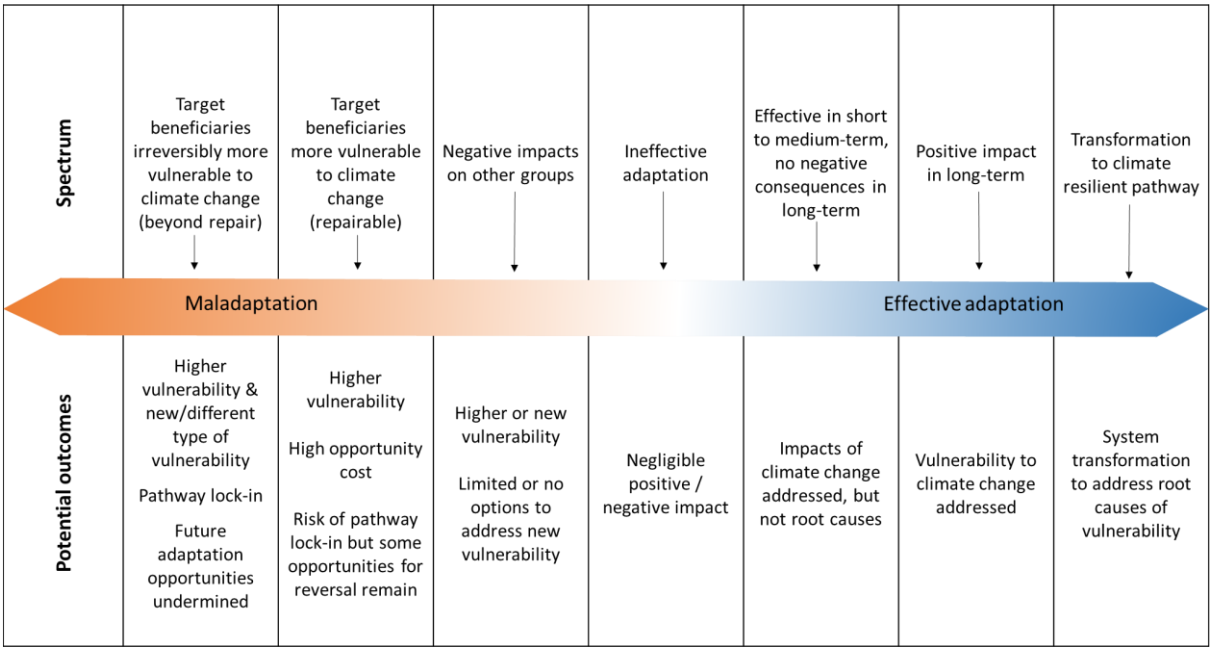
- **LEG guidelines to formulate and implement NAPs** published in 2012 provide a step-by-step process of how to develop and implement NAPs including measures to review effectiveness. The guidelines highlight the importance of designing an M&E to identify a few selected areas, and specific metrics to enable an assessment of progress, effectiveness, and gaps (PEG). During the NAP implementation process, information on the pre-defined metrics is to be collected. After a certain period, effectiveness, based on the degree to which vulnerabilities and risks to climate change have been reduced, is to be assessed using the pre-defined metrics. A synthesis could then enable a review of progress, effectiveness, and gaps, and thereby identify needed adjustments (LDC Expert Group, 2012[68]). The LEG PEG M&E tool currently focuses on the NAP process and is being further developed to cover the outcomes and impacts of adaptation actions and NAPs (LDC Expert Group, 2015[71]).
- The 2022 **Working Group II contribution to the IPCC's Sixth Assessment Report** assesses evidence for transformational adaptation in the literature to assess the extent to which adaptation actions have been implemented widely (scope), in-depth, rapidly (i.e., efficiently), and consider adaptation limits. Single criteria frameworks aggregate different attributes into one number or a ranking, often quantified using benefit-cost analysis to assess efficiency or measures of social welfare. In contrast, multi-criteria frameworks simultaneously report multiple biophysical and socio-economic attributes and can provide more information on potential trade-offs and synergies (IPCC, 2022[6]).
- The **German Agency for International Co-operation (GIZ) guidebook on developing national adaptation M&E systems** developed in 2015 presents a set of questions to help policymakers and technical experts develop adaptation M&E systems. The questions are categorised into four building blocks of: 1) understanding the context for the M&E system, 2) identifying the content to be monitored, 3) designing the M&E system, and 4) presenting results that address the purpose of the M&E system. Issues related to effectiveness are mainly addressed in questions which address cause-and-effect relationships and the intended focus of the M&E system. The guidebook includes examples of adaptation outcomes which can inform/guide countries as they establish or improve their national M&E systems and consider how to track outcomes (Price-Kelly et al., 2015[8]).
- The **Global Programme of Research on Climate Change Vulnerability, Impacts and Adaptation (PROVIA) Guidance** developed in 2013 sets out different approaches for assessing climate change vulnerability, impacts and adaptation. It provides a decision framework to help select appropriate approaches, methods and tools for different contexts however the guidance focuses on M&E systems of adaptation projects rather than national adaptation actions which require different systems (Hinkel et al., 2013[72]). It also emphasises the use of indicators and thus excludes other M&E approaches that draw on more qualitative sources (Leiter, 2017[73]).

Source: Authors based on listed sources.

As there is no one single measure of what makes a successful or effective adaptation action, outcomes of adaptation actions could be viewed on a continuum from successful adaptation to maladaptation, rather than as a binary outcome (IPCC, 2022[6]). This continuum (illustrated in Figure 3.3) could range from positive outcomes that contribute to transformations to a climate resilient pathway to those that result in negative outcomes where target beneficiaries become irreversibly more vulnerable to climate change.

Over time, certain maladaptive/ineffective approaches could become less ineffective, e.g. by taking learning into account (Schipper, 2020[74]). Such a continuum could be used to indicate different degrees of successful/unsuccessful adaptation and could be considered in the context of the GST. It could also be helpful in informing national level self-assessments of progress.

Figure 3.3. A simplified continuum from successful to unsuccessful adaptation outcomes



Source: Authors adapted from (Schipper, 2020[74]) and (UNEP, 2021[40]).

3.2. Potential data sources for reviewing adequacy and effectiveness of adaptation action

Tools and approaches for reviewing adequacy and effectiveness rely on a range of data sources. This includes data from national M&E systems, academic and grey literature, and global data sets - see Table 3.2. Information from other processes outside the UNFCCC such as the Sustainable Development Goals (SDGs), Convention on Biological Diversity (CBD), and the Sendai Framework on Disaster Risk Reduction could also provide useful insights (see discussion below).

Table 3.2. Potential data sources for global adaptation assessments

Approach / Data source	Potential added value	Limitations
Systematic assessment of adaptation responses reported in academic literature including systematic reviews, evidence synthesis, meta-analysis, large comparative studies, and country-level assessments such as the GAP-Track tool by the Institute for Sustainable Development and International Relations (IDDRI)	Provides an indication of the status, trends, and gaps in adaptation responses; brings together multiple sources of information including scientific and grey literature, policy documents, expert & local knowledge, observations on the ground etc.	Not a representative sample; expert judgment exercise; some topics and regions not well covered; challenges in terms of comparability and aggregation and tracking over time
Self-reported progress documents by countries (e.g., National Communications, Biennial Transparency Reports or domestic progress and evaluation)	Context-specific information and official government documents enable assessments of national progress	May only be available every few years; content is sensitive to political and policy changes; possible bias towards positive examples; challenges in terms of comparability and aggregation; inconsistency in definitions and use of concepts
Self-reported information from the private sector on actions taken in response to climate risks within the context of climate-related financial disclosure or in company reports (e.g. Task Force on Climate-Related Financial Disclosures, International Integrated Reporting Council, Sustainability Accounting Standards Board, Global Reporting Initiative)	Provides an indication of the status, trends, and gaps in adaptation responses by the private sector; complements information published in the scientific literature; could enable better understanding of supply chain risks	Sample biased towards larger companies; challenges in terms of comparability and aggregation; potential inconsistencies in definitions and use of concepts; difference in capacity to undertake assessments
Project documents and evaluations (e.g., from climate funds or implementing organisations)	Detailed information on context, intended or achieved results and activities	Actual implementation can differ from what was proposed; fragmented picture of local or regional actions; results may be challenging to aggregate; challenges in terms of comparability and aggregation; inconsistency in definitions and use of concepts
Existing global data sets of mostly quantitative indicators	Comparable information based on globally defined indicators	Global data availability constrains indicator choice; reporting burden for new indicators; trade-off between global applicability and national circumstances; usefulness and meaningfulness of global indicators is contested
Tracking financial flows (e.g., OECD Rio markers; climate finance tracking method of multilateral development banks)	Comparable data on financial flows directed at adaptation; standardised methodologies	No information about implementation of measures and their adaptation effect (Eriksen et al, 2021), i.e., it tracks inputs, not outputs or outcomes; inconsistencies between different sources in terms of what is counted as adaptation finance
Combing data sources (scientific and grey literature) and using triangulation	Triangulation can help identify and confirm progress and reduce the risk of misrepresentation and double counting.	Data might have limited comparability on a higher aggregation level

Source : (Garschagen et al., 2022[55]) ; (Tompkins et al., 2018[75]) and (Dale et al., 2021[76]).

Different types of information could be useful for delivering the GST mandate to review adequacy and effectiveness of adaptation, including both quantitative or qualitative indicators and narratives. Broad, results indicators, e.g., physical infrastructure and assets improved, increased use of climate resilience related tools, instruments, and strategies by public and private actors, need to be complemented by sector-specific metrics as adaptation outcomes differ across sectors or policy areas (OECD, 2022[18]). For example, the Global Commission on Adaptation has developed metrics such as the proportion of agricultural area under productive and sustainable agriculture, improvements in human productivity in the face of increasing climatic variability etc. (Leiter et al., 2019[77]). While indicators are useful, they do not

give the whole picture owing in part to the context-specific nature of adaptation and need to be complemented with qualitative information for a comprehensive understanding of adequacy and effectiveness (OECD- UK Climate Change Committee, 2021[78]).

Currently, the main source of information for reviewing adequacy and effectiveness is generated through M&E of adaptation as well as vulnerability risk assessments (Adaptation Committee, 2021[10]). To help cater for the context- specificity of adaptation, an assessment of adequacy and effectiveness could rely on information from different levels. For example, national-level self-assessments could aim to measure how well adaptation is coordinated and integrated in national priorities (Adaptation Committee, 2022[12]) and similar assessments could be conducted at the sub-national, project and/or community level (see example of Kenya in Box 3.3). Information from these different levels could be aggregated by linking M&E systems across scales (Leiter, 2015[79]).

Box 3.3. Measuring adaptation at the national and sub-national level: Insights from Kenya

In Kenya, a national M&E system is being developed as a component of its Transparency, Measurement, Reporting and Verification (MRV+) system which combines adaptation and mitigation tracking. The MRV+ system includes 62 national-level process-based indicators (e.g., percentage of classified roads maintained and rehabilitated) and 28 outcome-based indicators on the sub-national (e.g., percentage of county road that have been made climate resilient). The sub-national indicators were piloted in various counties to demonstrate their applicability and help operationalise a county-level M&E system. At the national-level, the MRV+ system is expected to be fully functional by mid-2023. The experience in Kenya highlights the importance of embracing a learning-by-doing approach to adaptation M&E. Kenya's approach has been to start simple, build on existing systems and draw on a range of data sources to adopt a phased approach that allows for flexibility and can improve over time.

Source: Authors based on (Christiansen, Martinez and Naswa, 2018[80]); (Government of Kenya, 2021[81]); (Lelekoitien, 2022[82]).

3.3. Potential options for aggregating information on adequacy and effectiveness

Aggregation is a significant challenge to fulfilling the GST mandate on adaptation as it "is not possible to add up information on the adequacy and effectiveness of adaptation action around the globe to a single figure or to represent it through a globally applicable metric in a scientifically sound manner as is being done in the case of mitigation" (Adaptation Committee, 2021[10]). Indeed, aggregating adaptation-related information at local and national levels may not be desirable in some situations, i.e. where context specificity is relevant to the assessment of progress and/or effectiveness. For example, while it may be technically possible to combine indicators from different climate risk management dimensions into one index, such an index would provide an aggregated figure which may not be helpful in understanding the effectiveness of adaptation activities for different national contexts (Craft and Fisher, 2016[58]).

Given multiple indicators and approaches used to measure outputs or outcomes of individual adaptation actions, there is no "common denominator" that can be used to aggregate the effects of different actions in different countries. Thus, a global review of adequacy and effectiveness of adaptation will need to draw on information from individual assessments at different scales and apply various methodologies and approaches to enable a collective assessment. There are some examples of qualitative assessments across countries that use a scorecard/scoreboard approach (see Box 3.4), however these have largely focused on processes rather than outcomes to date and necessarily involve some degree of approximation. Other global processes such as the CBD (see discussion below) have used different colour codes/traffic lights to provide a synthetic overview of aggregated progress across different dimensions.

Box 3.4. Selected examples of scorecard approaches

- The **Monitoring and Reporting toolkit from the Pilot Program for Climate Resilience (PPCR)** includes one element (out of five) to help countries assess the effectiveness of actions against climate variability. Element four in the PPCR toolkit assesses the extent to which vulnerable target groups use climate responsive tools, strategies, or activities to respond to climate variability. These climate responsive tools, strategies, and activities can be applied to enhance the resilience of people (i.e., public awareness), goods (i.e., building improvements), or services (i.e., flood protection). Although the toolkit provides tables that set the frame for qualitative and quantitative questions to be asked in each element, each country establishes their own element-specific criteria to score different aspects (Climate Investment Funds, 2016[83]). As each country establishes their own element-specific criteria it would be challenging to compare scores. The indicators are inserted into a larger model (PPCR logic model), which aims to show how inputs and activities results in program outcomes and national or international impacts (Climate Investment Funds, 2012[84]).
- The **Global Adaptation Progress Tracker (GAP-Track) developed by the Institute for Sustainable Development and International Relations (IDDRI)** uses a question matrix, expert judgement, and a scoring system to assess progress across representative global adaptation challenges (e.g., coastal, urban, rural, mountain, etc.), drawing on multiple sources of information. The tracker has six overarching questions and 19 sub-questions relating to different dimensions of climate adaptation. This includes questions relating to the adequacy of adaptation actions and actual climate risk reduction (i.e., effectiveness). It uses a scoring system, from 0 (no progress) to 4 (high contribution to adaptation progress) informed by an expert judgement exercise and supported by evidence. The degree to which experts agree on scores determine the confidence level of the specific score. National-level pilots were conducted in Mauritius and Senegal in 2021 to test the feasibility of applying the GAP-Track approach and a global test case for coastal adaptation is being conducted with full results expected to be available for the GST2 cycle. The GAP-Track uses a scorecard approach to create a common language (i.e., scores) between experts and different adaptation dimensions and a basis for cross-dimensional analysis which could complement other country and indicator-based approaches to assess progress (Magnan et al., 2021[85]).
- In the **European Union (EU), the adaptation preparedness scoreboard** was developed as part of the evaluation of the 2013 EU Adaptation Strategy (European Commission, 2018[86]). The scoreboards helped assess Member States' adaptation policies. The scoreboard set out 11 indicators and related sub-indicators across different steps of the adaptation policy cycle (European Commission, 2018[87]). In relation to M&E, sub-indicators included process related questions, e.g. whether adaptation action at regional/subnational/local level was monitored and results disseminated; whether a periodic review of the national adaptation strategy and action plan was envisaged and if stakeholders were involved in the assessment process. The EU scoreboard was an example of aggregating adaptation information across countries; however, it was not a straightforward exercise and faced several challenges which resulted in it being discontinued as a practice (Personal communication, 2022). Moreover, the EU approach focused on assessing and reviewing processes rather than outcomes/impacts and did not address certain challenges, for example relating to financing, which may be an important constraint in certain countries. The European Commission is currently developing adaptation indicators and a resilience assessment framework for the 2021 EU Adaptation Strategy building on lessons from its experience with the adaptation preparedness scoreboard (European Commission, 2021[88]).

In the GST context, one possible approach could be to rely on country self-assessments of the adequacy and effectiveness of their own actions. These self-assessments could be based on different approaches, e.g. triangulated assessments, mixed methods, scorecards, a continuum, etc. These self-assessments could be integrated in M&E systems and build on lessons from current experiences, e.g. to start simple, draw on multiple sources of information, adopt a phased approach that allows for flexibility and can improve over time. The GST could then compile the findings from country self-assessments to provide an approximate assessment of global trends (Craft and Fisher, 2016[58]). This would necessarily be an approximate assessment, as it involves aggregation of non-comparable information. Nonetheless it could enable the GST to make a simple "traffic light" assessment of progress and gaps in relation to specific types of action (e.g. coastal protection), for specific areas of the GGA (e.g. increased adaptive capacity) or representative global and regional climate risks (e.g. global mean surface temperature increase; temperature extremes and heatwaves; global sea level rise; etc.).

3.4. Insights from other processes beyond the UNFCCC and potential links to the GST

Existing global processes with adaptation-related monitoring and evaluation systems include the SDGs (United Nations, n.d.[89]), the Sendai Framework (UNDRR, n.d.[90]), and the CBD (CBD Secretariat, n.d.[91]). These global frameworks include some goals, targets and indicators that relate to climate change adaptation to varying degrees – see Table 3.3. This mapping indicates some overlaps/common themes, but also highlights the diversity in targets and indicators given the differing scope/focus/rationale of each process. Moreover, existing indicators under these processes mainly focus on inputs and outputs, rather than outcomes. Thus, while efforts under other global processes could provide some insights relevant to assessing overall progress on adaptation under the GST, they may not necessarily provide useful inputs on adequacy and effectiveness of adaptation.

To assess progress towards their respective targets/goals, the SDGs, Sendai Framework and CBD have established monitoring systems through which national-level findings are reported back to the global level to inform an assessment at the collective level. These global monitoring systems could provide some useful insights to the GST process. For example, to support national and local self-assessments of efforts towards priorities for action under the Sendai Framework, custom targets and indicators are available, scorecards for local self-assessment have been developed (i.e. Making Cities Resilient Scorecards), technical guidance for monitoring and reporting has been prepared and terminologies endorsed by the UN General Assembly (UNDRR, 2022[92]). There are also linkages between information reported under different systems, for example, SDG target 13.1 and Sendai Framework target E both quantify countries with disaster risk reduction plans (Leiter, 2017[93]). SDG indicators related to disaster risks are borrowed from the Sendai framework and country reporting on related indicators under the Sendai Framework are fed directly into UN reports on the SDGs (UNDRR, 2022[92]). Identifying such linkages has helped ensure collected data contributes to tracking progress under different global processes (UNDRR, 2019[94]).

On-going processes and exercises, such as the mid-term review of the Sendai Framework expected to conclude in 2023 (UNFCCC, 2022[57]) and discussions on the post-2020 global biodiversity framework expected to conclude in December 2022, could provide an opportunity to explore potential linkages and synergies with the GST under the Paris Agreement. For example, in discussions on the post-2020 Global Biodiversity Framework, one issue currently under consideration is a GST under the CBD to assess progress towards the new global biodiversity goals and targets every five years (SBI, 2020[95]); (Maljean-Dubois et al., 2022[96]). Depending on the outcomes of CBD COP15 and the envisaged timeline of any potential future GST process under the CBD, there could be potential synergies and complementarities between the two stocktaking exercises (CBD, 2022[97]).

While potential synergies/links between the different globally processes could usefully be explored, e.g. to reduce the burden of data compilation for the respective reporting channels, it is important to keep in mind the limitations given the differing scope/focus/rationale of each process. The areas of disaster risk reduction, biodiversity protection, climate risk management and sustainable development overlap only in some respects, for example, several key aspects of adaptation such as flooding, heat stress, coastal resources and terrestrial and freshwater ecosystems are not covered by the SDGs. Thus, reviewing global progress on adaptation with indicators specifically designed to measure progress for specific issues under other processes will not be sufficient (Leiter, 2017[93]) and need to be complemented by other approaches.

Table 3.3. Mapping adaptation-related targets and indicators from the SDGs, Sendai Framework, and the CBD 2011-2020 Aichi Targets

Common themes	Target	Indicator
Disaster risk management	SDG 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries SDG 13.2 Integrate climate change measures into national policies, strategies, and planning SDG 1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social, and environmental shocks and disasters SDG 11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels	SDG 13.1.1/1.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population SDG 13.1.2 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 SDG 13.2.1 Number of countries with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of the United Nations Framework Convention on Climate Change SDG 1.5.3 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 SDG 11.b.1 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 SDG 11.b.2 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies
	Sendai Framework A: Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortalities between 2020-2030 compared with 2005-2015 Sendai Framework B: Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared with 2005-2015. Sendai Framework E: Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.	Sendai Framework A-1: Number of deaths and missing persons attributed to disasters, per 100,000 population. Sendai Framework B-1: Number of directly affected people attributed to disasters, per 100,000 population. Sendai Framework E-1: Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030.
	CBD Aichi Target: n/a	CBD Aichi Target indicator: n/a

Freshwater resources	SDG 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	SDG 6.4.1: Change in water-use efficiency over time
	Sendai Framework: n/a	Sendai Framework: n/a
	CBD Aichi Target: 4 By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	CBD Aichi Target indicator: Change in water use efficiency over time; Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
Food production	SDG 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding, and other disasters and that progressively improve land and soil quality	SDG 2.4.1: Proportion of agricultural area under productive and sustainable agriculture
	Sendai Framework: n/a	Sendai Framework: n/a
	CBD Aichi Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	CBD Aichi Target indicator: Proportion of agricultural area under productive and sustainable agriculture
Coastal and marine areas	SDG 14.5: By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information	SDG 14.5.1: Coverage of protected areas in relation to marine areas
	Sendai Framework: n/a	Sendai Framework: n/a
	CBD Aichi Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative, and well-connected systems of protected areas and other effective area-based conservation measures and integrated into the wider landscapes and seascapes.	CBD Aichi Target indicator: Coverage of protected areas in relation to marine areas
Forest management	SDG 15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	SDG 15.2.1: Progress towards sustainable forest management
	Sendai Framework: n/a	Sendai Framework: n/a
	CBD Aichi Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced CBD Aichi Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	CBD Aichi Target indicator: Progress towards sustainable forest management
Land degradation	SDG 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought, and floods, and strive to achieve a land degradation neutral world	SDG 15.3.1: Proportion of land that is degraded over total land area
	Sendai Framework: n/a	Sendai Framework: n/a
	CBD Aichi Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	CBD Aichi Target indicator: Proportion of land that is degraded over total land area

Source: Author based on (Shah, 2018[98]), (Convention on Biological Diversity, 2016[99]), (Kato and Ellis, 2016[13]), (Vallejo, 2017[54]), (United Nations Statistics Division, 2022[100]), (UNDRR, n.d.[101]), (Convention on Biological Diversity, n.d.[102]), (Leiter, 2017[93]), (UNDRR, n.d.[103]).

Experiences with monitoring progress towards the goals and targets under the SDGs, Sendai Framework and CBD highlight several challenges to assessing progress at the collective level which could be useful for the GST process. For example, the multi-year process by the UN Statistics Division to identify a globally applicable and feasible set of adaptation indicators indicates some of the trade-offs, lack of globally available data and the challenge in expressing local adaptation outcomes through global indicators (UNEP, 2021[40]). An analysis of the SDG database for 2013-2016 indicates a lack of data across the SDGs, in particular for SDG 13. Information on SDG 13 only covered 153 countries (the lowest coverage among all the SDGs) with only 4.4% of data points available for SDG 13 (Dang and Serajuddin, 2020[104]). To address such data gaps, one potential option in the short-term could be to use statistical modelling to provide estimates for missing data points. For example, a mixed imputation method with data from the micro level (e.g. from individual or household surveys) and macro level (e.g. from national data sources) could be used (Dang and Serajuddin, 2020[104]). When country level data is unavailable, regional data could also be used in such methods (Bonjour et al., 2013[105]). Other possible options could be to use grey literature or other approaches such as expert judgement (Ley and Nalau, 2022[106]).

Another challenge relates to the alignment of global and national targets and indicators and difficulties in comparing different approaches. For example, to help monitor progress towards the 2011-2020 Aichi Targets, the CBD proposed a flexible framework and identified an indicative list of indicators, which were recommended for use, but were not obligatory. This flexibility led to countries using different data, indicators, and methodologies to report progress under each Aichi target which led to difficulties in comparing and assessing progress across countries (UNEP-WCMC and Biodiversity Indicators Partnership, 2021[107]). To address this challenge, one potential option is to create a system of headline indicators (quantitative and qualitative) with a subset of headline indicators where countries use the same metric (OECD, 2019[108]). In on-going discussions on the post-2020 Global Biodiversity Framework, countries are considering a tiered approach of headline indicators, component indicators and complementary indicators to assess progress towards the new global targets. Potential headline indicators related to adaptation currently being considered link to selected SDGs (i.e. SDG 2.4.1, 13.2.1, 15.2.1, 15.3.1) and the adaptative capacity of natural ecosystems (UNFCCC, 2022[57]; CBD, 2022[109]). Effectiveness is also mentioned in proposed headline indicators, e.g. “Diversity of governance types and effectiveness in biodiversity conservation” (CBD, 2022[109]).

Another important challenge relates to the aggregation of quantitative or qualitative indicators. In general, qualitative indicators are difficult to aggregate and are either not aggregated and used on an individual basis, translated into quantitative results/scores (Gomez, 2017[110]; United Nations Office on Drugs and Crime, 2018[111]) or clustered by common elements across countries. For example, under the Sendai Framework, Target E includes qualitative elements (e.g. indicator E-1 requires an understanding of national risk reduction strategies – see Table 3.3). For reporting purposes, evaluators must first identify whether a national strategy is in place, and then assess its alignment with the Sendai Framework based on a scoring system against 10 criteria. Average scores submitted by countries are then calculated and fed into the Global Assessment Report. While such a system has some disadvantages (e.g. based on subjective interpretations of scoring by the evaluator), it is seen as a useful approach if there are consistent submissions of this type of data (UNDRR, 2019[94]). Another option could be to use a traffic light system. For example, to assess progress under the 2011-2020 biodiversity framework, the Global Biodiversity Outlook uses a colour-coded system to indicate whether the target has been met (blue), is on track to being achieved (green), some progress has been made (yellow), no change (red), moving backwards (purple) and could not be assessed (grey) (Secretariat of the Convention on Biological Diversity, 2020[112]).

4. Understanding how the GST can facilitate enhanced implementation of adaptation action

4.1. Unpacking potential GST outcomes to enhance implementation

The aim of the GST, as set out in Article 14 of the Paris Agreement is to "inform Parties in updating and enhancing, in a nationally determined manner, their actions and support…, as well as enhancing international co-operation for climate action". This intended outcome is reiterated in Article 4.9 which states that Parties' NDCs are to "be informed by the outcomes of the global stocktake" (UNFCCC, 2016[113]). What it means to "inform" and "enhance" national action and international co-operation is not clear and there is no guidance on how this could be done in practice (Jeudy-Hugo and Charles, 2022[5]).

Article 7.14 of the Paris Agreement further specifies that the GST shall "enhance the implementation of adaptation action". This is closely related to other aspects of the GST mandate on adaptation including to review adequacy and effectiveness of adaptation. Assessing the adequacy and effectiveness of adaptation action and learning from successful and unsuccessful practices could help to inform future adaptation efforts which in turn could support enhanced implementation of action. Similarly reviewing the adequacy of adaptation support could also potentially lead to enhanced implementation of adaptation action if it leads to increases in adaptation finance.

Beyond the intended outcomes of the GST established in the Paris Agreement, there are further potential outcomes that could result from the GST process. Further outcomes relating to the GST mandate to review adequacy and effectiveness of adaptation could include:

- *Identifying information needs and knowledge gaps to review adequacy and effectiveness on a consistent and comparable basis*: The GST could help to identify the type of information needed to review adequacy and effectiveness and key knowledge gaps in this regard. This would build on the mandate provided by decision 19/CMA.1 to SBSTA and SBI to identify information gaps relating to the GST and request additional input (UNFCCC, 2018[2]). Relevant actors, including the IPCC, could then seek to generate knowledge to fill identified gaps. Such information could inform Parties adaptation actions going forward and feed into subsequent GST cycles. This information could also potentially be used to inform and streamline future reporting requirements under the Paris Agreement and other global efforts such as the SDGs, Sendai Framework and CBD to reduce duplication of efforts and reporting burden (Adaptation Committee, 2021[10]).
- *Increasing understanding of available tools and methodologies for assessing adequacy and effectiveness of adaptation action which can be applied at different scales and in different contexts:* Improving understanding of the pros and cons of different tools and methodologies, including potential synergies/complementarities, and potential options to combine different approaches in triangulated assessments or mixed methods could help to inform the development of Parties' M&E

systems and inform subsequent GSTs, supported by improved data collection and reporting in future years.

- *Sharing good practices and lessons learned on improving effectiveness of adaptation action:* Disseminating lessons learned and good practices of effective adaptation actions, including successful and unsuccessful practices, can help identify similarities in approaches and enabling conditions / criteria influencing effectiveness of adaptation action. This could build on the provision for Parties to share information on good practices, experience and lessons learned including in relation to "[i]mproving durability and effectiveness of adaptation actions" included in the Annex to decision 18/CMA.1 IV.H, paragraph 116.a(vi) (UNFCCC, 2018[114]). This compilation could in turn help inform Parties' as they design and implement adaptation actions to consider factors that can enhance effectiveness, e.g. comprehensive understanding of climate risks, interaction with target beneficiaries, avoidance of maladaptation (UNEP, 2021[40]).

4.2. Mapping possible GST outputs on adequacy and effectiveness of adaptation

As set out in decision 19/CMA.1, outputs of the GST "should summarise opportunities and challenges for enhancing action and support in the light of equity and the best available science, as well as lessons learned and good practices" ; … "assess collective progress, have no individual Party focus, and include non-policy prescriptive consideration of collective progress" (UNFCCC, 2018[2]). Decision 19/CMA.1 set out a mix of technical (e.g. synthesis reports by the UNFCCC Secretariat, summary reports of the technical dialogues) and political outputs (e.g. high-level events, CMA decision and/or declaration) across the three components of the GST.

The focus, clarity, and format of the final package of GST outputs, and the participation of relevant stakeholders in their development, is critical. "Specific, actionable outputs can facilitate follow-up by different actors" (Jeudy-Hugo and Charles, 2022[5]). The final package of outputs from the 'Technical assessment' component and 'Consideration of outputs' component of GST1 could include different elements targeting different actors. Potential elements of the final package of GST1 outputs relating to the mandate to review the adequacy and effectiveness of adaptation are summarised in Table 4.1.

Table 4.1. Potential GST1 outputs on the mandate to review adequacy and effectiveness of adaptation

Element	Detail
Recommendation of possible follow-up actions by Parties	Parties could be invited to conduct self-assessments of the adequacy and effectiveness of their own adaptation efforts as part of their reporting on adaptation in their national submissions to the UNFCCC in line with the Annex to decision 18/CMA.1. Parties could also be invited to consider how to improve the "effectiveness and durability of adaptation actions" in line with Article 7.7(e) of the Paris Agreement.
Recommendation of possible follow-up actions by relevant bodies	The AC, in collaboration with LEG and SCF could be invited to take forward technical work to further assess and explore the relative strengths and weaknesses of different approaches, tools and methodologies to reviewing adequacy and effectiveness of adaptation, their potential synergies/complementarities, and potential options to combine different approaches in triangulated assessments or mixed methods. This could build on the on-going work by the AC and LEG, in collaboration with the SCF which has focused on only compiling existing methodologies. Other relevant bodies could be encouraged to incorporate GST outputs in their work. For example, the Paris Committee on Capacity-building (PCCB) could prioritise capacity building support towards enhancement of adaptation M&E systems (and ideally MEL to incorporate learning).
Recommendation of possible follow-up actions by UNFCCC processes	UNFCCC Secretariat could be invited to consider how activities under the GlaSS work programme on the GGA can complement the GST process, including how efforts to identify methodologies, indicators, data, and metrics for assessing progress towards the GGA can inform the review of adequacy and effectiveness in subsequent GST processes.
Recommendation of possible follow-up actions by scientific community	Encourage the research community, including the IPCC, to address priority gaps in information, guidance, and methodologies identified by the GST technical dialogue process, including updating relevant adaptation related methodologies and guidelines.
Recommendation of possible follow-up actions by non-Party stakeholders	Non-Party stakeholders, relevant organisations and institutions could be encouraged to incorporate GST adaptation related recommendations in their work, e.g., to support National Adaptation Plan (NAP) planning processes and/or the development (or linking) of M&E (and MEL) systems in different countries, generate knowledge to fill identified gaps in data to assess adequacy and effectiveness of adaptation to feed into subsequent GST cycles.
Technical annex* identifying information needs and gaps for assessing adequacy and effectiveness	Identify the type of information needed to assess adequacy and effectiveness, map out existing data sources/products/climate models and identify and prioritise current gaps in data, methodologies, and guidance for assessing adequacy and effectiveness. This could build on relevant reports, e.g., IPCC WGII report, and on-going work, e.g., through Lima Action Knowledge Initiative (LAKI) to identify and prioritise adaptation knowledge gaps.
Technical annex on enabling factors and criteria for effective adaptation actions	Identify enabling factors, set of attributes or important criteria for effective adaptation actions building on good practices identified in national reports and other sources (e.g. in designing an inclusive M&E system that fosters learning), insights from literature on how to enhance effectiveness/success of adaptation action (e.g. IPCC WGII report) and on-going work by the AC-LEG-SCF joint working group (e.g. on potential criteria for reviewing adequacy and effectiveness of adaptation and support).

Note: Technical annexes could be appended to envisaged outputs from the 'Technical assessment' component of GST1.
Source: Authors.

One important enabling factor that could help to translate GST outputs into national action is a functional adaptation M&E system / an MEL system to incorporate learning over time. As discussed in section 2. , currently, few countries track implementation of their adaptation actions, and there is an opportunity to scale up efforts and learn lessons from experiences with establishing M&E systems (and emerging experiences with MEL), e.g., by starting simple, building on existing mechanisms, adopting a phased approach, focusing on continuous improvement, and learning, iterative nature, engaging key stakeholders, ensuring a sense of ownership etc. An M&E system focused on learning is important both for providing relevant inputs to inform the GST and for translating GST recommendations into national processes, for example by applying international best practices to the local context to enhance national and sub-national actions (IISD and NAP Global Network, 2022[51]). There is thus potential for positive feedback loops whereby GST outputs can feed into national efforts and help strengthen the domestic enabling environment, including M&E / MEL systems, which can lead to improved information, including on adaptation outcomes, which can in turn inform subsequent GST cycles.

5. Conclusions

The global stocktake (GST) under the Paris Agreement has a specific mandate on adaptation which includes enhancing implementation of adaptation action and reviewing the adequacy and effectiveness of adaptation. What it means to review adequacy and effectiveness at a global level, and how exactly the GST process could lead to enhanced implementation of adaptation action is however not clear and there are currently several challenges to addressing the GST mandate on adaptation.

Assessing the adequacy and effectiveness of adaptation action (both at the level of national actions and at a collective level) is an inherently complex task. Key challenges include the context-specific nature and long-time horizons of adaptation, differences in metrics used, limited data availability and shortcomings in current monitoring and evaluation (M&E) systems. Other challenges relate to differing goals, diverse risk perceptions (e.g. across and within societies), different assumptions concerning counterfactual scenarios, as well as uncertainties of climate impacts and future hazards which can also lead to different evaluations of the adequacy and effectiveness of adaptation action.

Moreover, assessing the adequacy and effectiveness of adaptation action is closely linked to other elements of the GST mandate on adaptation, in particular relating to support for adaptation. For example, the provision of adequate and effective adaptation support can be seen as an enabler for effective adaptation action. Similarly, the provision of adequate and effective adaptation support can help to enhance the implementation of adaptation action. Such inter-linkages are important to recognise; however they risk over-complicating the task at hand and could be further explored and unpacked over time as approaches are developed, data availability improves, and experiences gained.

Despite numerous challenges, assessing the adequacy and effectiveness of adaptation action is important at both the national and international level. At the national level, assessments of effectiveness, e.g. whether a specific risk is reduced, as well as the adequacy of that action, i.e. whether the risk reduction is sufficient, can guide planning and implementation of adaptation action, inform priorities for adaptation support and lead to enhanced ambition as countries improve and adjust their adaptation actions in light of experience. At the international level, assessments of adequacy and effectiveness can help to assess collective efforts and identify gaps towards global goals.

Data that is currently unavailable or not collected systematically would be needed to undertake a comprehensive collective assessment of the adequacy and effectiveness of adaptation action in GST1. At the national level, there is currently limited information available on adaptation action, partly due to conceptual challenges to assessing outcomes of adaptation action, limited capacities of some countries to collate such information, and the non-mandatory nature of countries' reporting requirements under the UNFCCC on these issues. Available global assessments of adaptation progress mainly focus on processes and outputs (e.g., policies and plans) with limited information on outcomes (i.e. effects) given current data availability. However, increasing efforts by many Parties, e.g. Bangladesh, Rwanda, Sweden, to develop and improve national adaptation monitoring and evaluation (M&E) systems, and subsequent reporting of such information including at the international level, will lead to a more comprehensive picture of adaptation globally and could contribute to assessments of collective progress, including under the GST.

Different approaches can be used to review the adequacy and effectiveness of adaptation actions. These approaches rely on a range of data sources, including country-led M&E systems. The selected approach depends on the underlying objective of the assessment and the specific context in which it is applied.

Analysis in this paper highlights that to inform an assessment of adequacy and effectiveness of adaptation action, it may be more appropriate to focus on outcomes (i.e. effects) rather than processes (i.e. planning and policies). However, it is not straightforward to track outcomes of adaptation actions for various reasons, including difficulties in establishing a cause-and-effect relationship between an adaptation action and its results. Outcomes of adaptation actions may thus need to be assessed via the use of proxies as for example is being done in some countries such as the UK which uses habitat conditions and species abundance as a proxy indicator for biodiversity.

A combination of different outcome-based approaches in triangulated assessments or mixed methods which bring together different types of information and methodological approaches, could help to provide a more comprehensive picture of the adequacy and effectiveness of adaptation action. For example, quantitative indicators could usefully be complemented with qualitative information and approaches, such as a theory of change approach and developing adaptation pathways could help to establish a cause-and-effect relationship between an adaptation action and its results and inform adaptation planning and implementation processes.

There are technical guidelines, international frameworks, and insights from other areas, including international development co-operation, which could provide useful insights for assessing adaptation actions. However, given the context-specificity of adaptation, any frameworks and guidelines need to be flexible enough to fit different contexts. Parties' current experiences could also provide useful lessons including on setting up robust M&E systems. For example, the combination of different components in the German M&E system, including indicator monitoring and independent evaluation reports, feed into and inform each other, while Kenya's approach to adaptation M&E has been to start simple, build on existing systems and draw on a range of data sources to adopt a phased approach that allows for flexibility and can improve over time.

Global processes, including the Sustainable Development Goals (SDGs), Sendai Framework, and Convention on Biological Diversity (CBD), include goals, targets, and indicators which relate to climate adaptation to varying degrees. These processes have developed systems through which national-level findings are reported back to the global level to inform collective assessments. These experiences provide insights on potential approaches to undertaking a collective assessment, e.g. national and local self-assessments under the Sendai Framework, and some of the related challenges, e.g. the time and resources needed to gather a comparable set of data, and approaches to aggregate national information in a collective assessment. Further work could be helpful in identifying potential linkages between different global processes, e.g. between the GST under the Paris Agreement and a possible GST under the CBD currently being considered in discussions on the post-2020 Global Biodiversity Framework. Further work on whether and how adaptation-related indicators in other global processes could feed into the GST could also be helpful, e.g. to reduce the burden of data compilation under respective reporting channels, while recognising the differing focus of each global process.

There is no "common denominator" that can be used to aggregate the effects of different actions in different countries. A collective assessment of adaptation under the GST will thus need to draw on various sources of information at different scales, apply different methodologies and complementary approaches. One possible approach discussed in this paper could be to use country self-assessments of their own adaptation efforts to feed into a collective assessment under the GST. For example:

- Countries could use different methods, e.g. triangulated assessments, mixed methods, scorecards, a continuum, etc., to prepare self-assessments of the adequacy and effectiveness of their own adaptation actions. The self-assessments could be focused on outcomes, in terms of capacity and risk for example, integrated in Parties' M&E systems and build on lessons from experiences, and good practices. Such self-assessments could be supported by technical guidance, as for example has been prepared to support national and local self-assessments under the Sendai Framework.

- The GST could compile findings from country self-assessments to provide a qualitative assessment of global trends. This would necessarily be an approximate assessment, as it would involve an aggregation of non-comparable information. Nonetheless, it could enable the GST to make a simple "traffic light" assessment of progress for specific types of adaptation action (e.g. coastal protection), for specific areas of the Global Goal on Adaptation (GGA) (e.g. increased adaptive capacity) or for representative global and regional climate risks (e.g. global mean surface temperature increase; temperature extremes and heatwaves; global sea level rise; etc.). Such an initial assessment could help to identify key gaps and how these could be addressed, with more refined approaches to the assessment to be developed over time as data availability improves.

Another aspect of the GST mandate on adaptation is to "enhance the implementation of adaptation action" as set out in Article 7.14 of the Paris Agreement. This is closely related to other elements of the GST mandate. For example, assessing the adequacy and effectiveness of adaptation action can provide an opportunity for learning from successful/unsuccessful practices, to inform future adaptation efforts, adaptation support and implementation priorities. Similarly, reviewing the adequacy of adaptation support could potentially lead to enhanced implementation of adaptation action if it leads to increased and more effective delivery of adaptation support.

Beyond the agreed outcomes of the GST established in the Paris Agreement, there are further potential outcomes that could result from the process. For example, the GST process could be helpful in:

- *Identifying information needs and knowledge gaps to review adequacy and effectiveness on a consistent and comparable basis.* The identification of such gaps could guide subsequent research efforts, including the Intergovernmental Panel on Climate Change's (IPCC) work programme in future assessment cycles. The results of these research efforts could feed into improved country efforts to assess the adequacy and effectiveness of their own adaptation actions and in turn inform future GST cycles. This information could also potentially be used by, or pooled with, other international processes to streamline/improve adaptation assessments worldwide.
- *Increasing understanding of available tools and methodologies for assessing adequacy and effectiveness of adaptation action which can be applied at different scales and in different contexts*: Improving understanding of the pros and cons of different tools and methodologies could also help to inform the development of Parties' M&E systems and provide improved information to feed into subsequent GSTs, potentially supported by improved data collection and reporting in future years.
- *Sharing good practices and lessons learned on improving effectiveness of adaptation action*: By disseminating insights on effective adaptation actions, including designing M&E systems, and learning from successful and unsuccessful practices, can help identify similarities in approaches and common factors / enabling conditions influencing effectiveness which could help to inform Parties as they design and implement their adaptation actions, to support a more strategic and coherent approach.

How to reach the intended outcomes of the GST is critical but not easy. An important question is how to ensure follow-up, and to encourage Parties and non-Party stakeholders to consider GST recommendations in their work going forward. As highlighted in previous CCXG analysis, the focus, clarity, and format of the final package of GST outputs, and the participation of relevant stakeholders in their development, is key.

The final package of outputs from the 'Technical assessment' component and 'Consideration of outputs' component of GST1 could include different elements targeting different actors to facilitate subsequent follow-up. Table 5.1 summarises potential elements the final package of GST1 outputs could contain in relation to its mandate to review the adequacy and effectiveness of adaptation.

Table 5.1. Potential GST1 outputs on adaptation

Element	Explanation
Recommendations of possible follow-up actions by Parties, relevant bodies, and UNFCCC processes*	Parties could be invited to conduct self-assessments of the adequacy and effectiveness of their own adaptation efforts as part of their reporting on adaptation in national submissions to the UNFCCC in line with Annex to decision 18/CMA.1.
	The Adaptation Committee (AC), in collaboration with Least Developed Countries Expert Group (LEG) and Standing Committee on Finance (SCF) could be invited to take forward technical work to explore the strengths and weaknesses of different tools and methodologies for reviewing adequacy and effectiveness, synergies/complementarities, and potential options to combine different approaches.
	Other relevant bodies could be encouraged to incorporate GST outputs in their work, e.g., the Paris Committee on Capacity-building (PCCB) could prioritise capacity building support towards enhancement of adaptation M&E systems / MEL to incorporate learning.
	The UNFCCC Secretariat could be invited to consider how activities under the GlaSS work programme on the GGA could complement the GST process, including how efforts to identify methodologies, indicators, data, and metrics for assessing progress towards the GGA can inform the review of adequacy and effectiveness in subsequent GST processes.
Recommendations of possible follow-up actions by non-Party stakeholders*	The research community, including the IPCC, could be encouraged to address priority gaps in information, guidance, and methodologies identified by the GST technical dialogue process, including updating relevant adaptation related methodologies and guidelines.
	Non-Party stakeholders, relevant organisations and institutions could be encouraged to incorporate GST adaptation recommendations in their work, e.g., to support NAP planning processes and the development of M&E/MEL systems in countries.
Technical annexes*	Identify the type of information needed to assess adequacy and effectiveness, map out existing data sources/products/climate models and identify and prioritise current gaps in data, methodologies, and guidance, building on relevant reports and on-going work.
	This could identify enabling factors, attributes, or criteria for effective adaptation actions, building on good practices identified in national reports, insights from literature and on-going work by the AC-LEG-SCF joint working group.

Note: Recommendations of possible follow-up actions could be included in envisaged outputs (CMA decision and/or declaration) from the 'Consideration of outputs' component of GST1.
Technical annexes could be appended to envisaged outputs (Summary reports and/or Factual synthesis report) from the 'Technical assessment' component of GST1.
Source: Authors.

There are several challenges to addressing the GST mandate on adaptation and it will not be possible to undertake a comprehensive assessment of the adequacy and effectiveness of adaptation action with currently available data in GST1. Nonetheless, the GST has the benefit of being a periodic exercise with a provision for learning-by-doing. This ability to incorporate learning and scope for continuous improvement provides an important opportunity to develop, apply and refine approaches and methodologies to reviewing adequacy and effectiveness of adaptation over time as new approaches are developed and data availability improves. Disseminating possible GST1 outputs on enabling factors for effective adaptation action, available methodologies to assess adaptation, and identification of priority gaps in data, could be an extremely useful way in which GST1 can help to inform and enhance Parties' adaptation actions in line with the long-term goals of the Paris Agreement.

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